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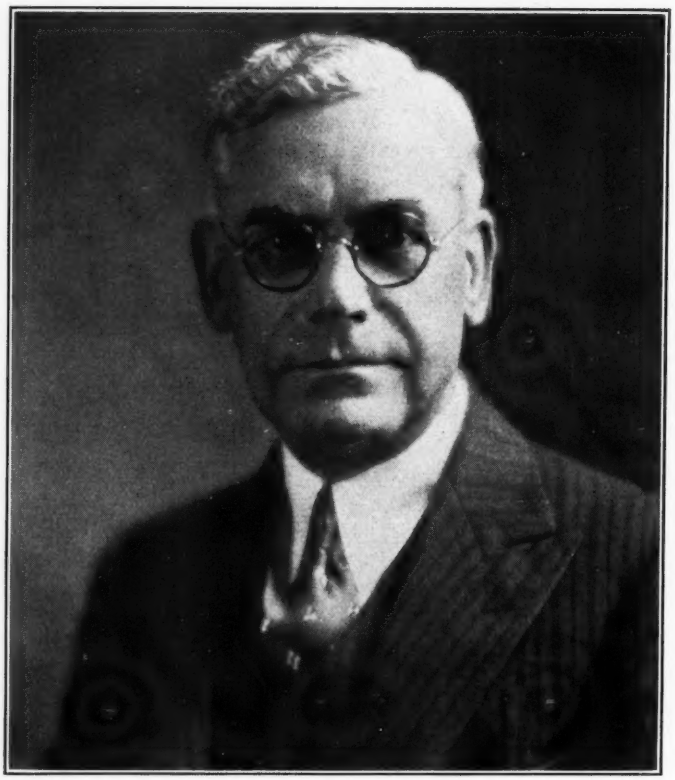

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ORIGINAL ARTICLES

THE ELECTROGALVANIC COMPATIBILITY OF ORTHODONTIC MATERIALS

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LAIN,[1] Lippman,[2] Ullman[3] and Friedlander[4] have recently presented papers substantiating the important fact that electrical currents produced in the mouth by the introduction of dissimilar metals may cause local lesions and systemic disturbances of a serious nature. Judging by similar events in the past, a storm of criticism and general condemnation of the entire orthodontic procedure will very shortly break. It is certainly our duty, in the light of this new appreciation of a generally known phenomenon, to examine the whole field of orthodontic materials with the greatest scrutiny, so that the exact state of affairs may be disclosed, and measures devised to protect the patient from all possible harm, at all events to establish the proper perspective on the subject.

An investigation of the electrogalvanic properties of all the common orthodontic materials in combination in mouths that are free from all other metallic substances, and then including also dental restorations, such as metallic fillings, bridges and other prosthetic devices, constitutes the simplest practical approach to the problem.

The instrument used to determine the intensity of electrical discharges was a Cambridge microammeter with a range of from 0 to 120 microamperes, and an internal resistance of 10 ohms which was properly damped for the field under study. As recorded in the tables, tests were taken in mouths free of all metallic substances, in mouths with orthodontic materials only, in mouths with amalgam fillings also present, and in a specially constructed cell of chemically pure gold, which when filled with saliva or other electrolyte could form a complete electrogalvanic circuit by the immersion of the positive material under review.

As the fundamental facts are stated in all textbooks on physics, only the metals of special interest in our field will be mentioned, and in their order of activity in the electromotor series from the positive end to the negative, as follows: aluminum, zinc, chromium, iron, nickel, tin, copper, mercury, silver, palladium, platinum, gold. As most of the metals employed in orthodontia are in alloy form, it is important to point out that the electrogalvanic property of a well-compounded alloy can be determined only by experiment, the properties of its component elements being no certain index of what it will actually be. This will be demonstrated in the tests of stainless steel alloys, which while containing a high proportion of chromium, react slightly with gold, contrary to expectation. The general run of high fusing materials are alloys of gold and members of the platinum family, commonly palladium. If they possess heat treatment quality, they also contain copper. Gold alloys of lower fusing point, in addition contain large parts of copper, and if white in color, zinc silver and nickel. On account of the scarcity of gold now prevailing, alloys are increasingly commonly encountered containing negligible quantities of gold, and large quantities of zinc, nickel and platinum. These white golds in particular deserve careful scrutiny, because of their high base metal content, which is not generally appreciated, when combined with alloys of higher precious metal content. Stainless steel, sweeping the field on account of economic conditions, is composed of chromium, nickel, cobalt and iron, in varying proportions, most of the formulas being technical secrets. Brass, commonly used for ligatures, and for general dental purposes in Europe under the name of Randolf's metal, contains copper, zinc and a trace of lead. Nickel silver contains copper, nickel and zinc. Aluminum bronze contains copper and aluminum. Block tin is the uniting medium for

TABLE I

MICROAMMETER READINGS IN MOUTHS CONTAINING APPLIANCES CONSTRUCTED WITH A SINGLE PRECIOUS ALLOY, AND FREE OF ALL DENTAL FILLINGS. ALL MOUTHS MILDLY ALKALINE IN P_H

CASE NO.		MICROAMPERES
361	All possible combinations	0
758	All possible combinations	0
768	All possible combinations Maximum	2
728	All possible combinations Maximum	2
736	All possible combinations Maximum	1
756	All possible combinations Maximum	2
618	Anterior section of retainer and lingual arch	2
503	Anterior section of retainer and lingual arch	1

Jackson's removable appliances. Zinc and copper are present as salts in dental cements. Gold inlays and crowns closely resemble orthodontic alloys in composition. Dental amalgam contains silver, tin and copper with traces of zinc, platinum and gold, to which mercury is added for amalgamation and the excess expressed.

In considering the clinical findings, in the first instance no currents could be discerned in mouths that were free from all metallic substances. With this fact as a control, attention was next directed to mouths containing appliances composed entirely of one quality of material for bands, tubes and arches, with the

cement testing zero. Table I shows findings for eight such cases. Currents ranged from a slight flicker to 2 microamperes constant by contacting various parts of the appliances. It must not be overlooked that currents of this type may be due to the coupling of the contact points of different composition, in this case pure platinum, with the alloys under test. It was impossible to detect any signs or symptoms suggestive of ill effects in any of these cases. The number was quite limited, however, and is not conclusive.

Table II records readings obtained in mouths free of all fillings, in which a series of combinations were made of a great number of the materials under observation. The P_H concentration was mildly alkaline in all the mouths except one which was neutral. It is a well-recognized fact that an increase in acidity will raise the intensity of current as much as 50 per cent with the same combination of metals. This allows the possibility to enter that in the event of an acid mouth existing during a period of ill health, an electrogalvanic reaction might occur of greater than usual power, at a time also when the tissues are less able to withstand trauma than usual.

TABLE II

MICROAMMETER READINGS IN MOUTHS WITHOUT DENTAL FILLINGS IN WHICH DIVERSE COMBINATIONS OF METALLIC SUBSTANCES WERE INTRODUCED OF INTEREST TO ORTHODONTICS. ALL MOUTHS ALKALINE IN P_H

POSITIVE MATERIAL	NEGATIVE MATERIAL	MICRO-AMPERES	POSITIVE MATERIAL	NEGATIVE MATERIAL	MICRO-AMPERES
Aluminum	Pure gold	90	Aluminum bronze	Gold	5
Aluminum	Pure platinum	45	22 Karat gold	Gold	1
Aluminum	Gold palladium copper	45	20 Karat gold	Gold	1
Aluminum	White gold alloy	30	18 Karat gold	Gold	2
Aluminum	Brass ligature	55	18 Karat gold solder, platinized	Gold	0
Aluminum	Stainless steel	40	14 Karat gold	Gold	3
Aluminum	Nickel silver	40	10 Karat gold	Gold	8
Block tin	Pure gold	10	Brass ligature	Gold	4
Block tin	Pure platinum	5	Randolf's alloy (brass)	Gold	6
Block tin	Nickel silver	8	Nickel silver	Gold	2
White gold alloy	Pure gold	10	Nickel silver	Platinum	1
White gold alloy	Pure platinum	2	Nickel silver	Brass ligature	1
White gold alloy	Block tin	0	Nickel silver	Gold palladium copper	Minute
White gold alloy	Brass ligature	2	Stainless steel	Gold palladium copper	Minute
White gold alloy	Nickel silver	1	Stainless steel	Nickel silver	Minute

Table III records the readings obtained in mouths containing metallic fillings, in which high quality orthodontic materials were used for appliances. Readings of 10 micros constant were commonly obtained by contacting various parts of the appliances; whereas the highest readings found in mouths free of fillings was 2. In this group, four individuals showed appreciable signs and symptoms similar to those described by the original investigators, namely, vibration, nausea, metallic taste and loosening and disintegration of amalgam fillings.

TABLE III

MICROAMMETER READINGS IN MOUTHS WITH AMALGAM FILLINGS IN COMBINATION WITH GOLD PALLADIUM ALLOYS USED FOR CONSTRUCTING BANDS, LABIAL AND LINGUAL ARCHES AND ANTERIOR SECTIONS OF RETAINERS

CASE NO.	SUBSTANCES		MICROAMPERES	REMARKS
293	Old amalgam	Lingual arch	0	
110	Old amalgam	Band	1	
618	Old amalgam	Anterior section	2	
589	Old amalgam	Lingual arch	2	
589	Same filling polished	Lingual arch	5	Heat may have liberated free mercury
110	Another filling	Lingual arch	2	
686	Old amalgam	Anterior section	2	
779	Old amalgam	Lingual arch	2	
731	Old amalgam	Lingual arch	2	
715	Old amalgam	Lingual arch	2	
627	Old amalgam	Anterior section	3	
660	Old amalgam	Lingual arch	2	
690	New filling	Lingual arch	4	
690	Another new filling	Lingual arch	40	No effect noticed
690	Same new filling 1 day later	Lingual arch	10	Oxidation of surface?
416	Old filling	Lingual arch	10	No effects
577	Filling in contact with molar band		25	Loss of mass. No effects noticed
577	Old filling	Lingual arch	5	
577	Gingival filling not touching band		25	Tooth tender. Replaced with cement. Relief
577	Replacing first filling touching band		8	Disintegrating slowly
607	Old amalgam	Anterior section	5	Metallic taste. Nausea
778	New amalgam	Band. Speck wedged	20	Shock to tongue. Vibration. Relieved on removal
778	Same 4 weeks later	Band	20	Specks gave same effects. No other signs
720	Old filling	Lingual arch	5	
720	Same polished	Lingual arch	5	

TABLE IV

MICROAMMETER READINGS OF A CELL CONSTRUCTED OF A 24 KARAT GOLD SHELL FILLED WITH NORMAL SALIVA IN COMBINATION WITH DIVERSE METALLIC SUBSTANCES OF INTEREST TO ORTHODONTICS

MATERIAL	MICROAMPERES
Dental alloy amalgam, excess of mercury	90
Same, 4 weeks later	90
Old amalgam from an extracted tooth	4
Fresh amalgam, well prepared	5
Aluminum	95
Melotte's metal	45
Aluminum bronze clamp band	10
Block tin	10
White gold alloy	5
10 Karat solder	10
Stainless steel wire	2
Brass ligature	2
Randolf's alloy (brass)	2
Nickel silver band material	Minute
Platinum	0
Gold palladium alloy	0
Zinc oxyphosphate cement	0
Copper oxyphosphate cement	0
Dark elastic, black, gold dust vulcanite	0
Phosphor bronze wire	0
Gold platinum copper wire	Minute

CASE 1.—No. 778, girl, aged fifteen years, wearing maxillary and mandibular labial and lingual appliances, of high quality gold palladium alloy, and stainless steel ligatures. The highest reading in any combination of the appliances was 1 microampere constant. Immediately following the insertion of a large amalgam filling on the distal surface of the mandibular second right molar, she complained of violent vibration in the tooth, a salty taste, and a stinging sensation at the part of the tongue in contact with the tooth. A reading of the contacts between the filling and the appliances registered 20 microamperes constant. A small shaving of amalgam was found wedged between the first and second molar, in contact with the band on the first molar. With the removal of this mass, the sensations immediately disappeared. The filling still gave the original reading of 20 microamperes. Readings obtained from Different parts of the appliances still remained at a maximum of 1 microampere. In three weeks the potential of the filling dropped to 8, and no further response has been sensed by the patient, although specific instructions were given to be alert to the slightest sensation.

CASE 2.—No. 577, girl, aged fourteen years, wearing bands on the mandibular first molars and a plain lingual arch, had an amalgam filling inserted on the distal surface of the right second premolar. Ammeter reading was 25 microamperes, without any reaction from the patient in any way. The filling was hard but dull immediately after insertion. The following day a great part of the filling had disappeared, leaving 1/16 inch of the cavity walls exposed. The reading was 5 microamperes. On scraping the surface for contact with fresh material, the reading was the same. A new filling was inserted by the dentist, care being taken in eliminating excess mercury, and in packing the filling. After two weeks, the second amalgam filling showed signs of disintegration, but not to the same extent as the first. This second amalgam gave a reading of 8 microamperes at its highest.

There is reason to believe that the high currents produced by amalgam are liable to be due to the presence of free mercury, which acts to decompose the alloy into its component elements. To test this possibility a mass of amalgam was prepared which showed free mercury on its surface some days after setting. The surface material was trimmed away by forming it into a regular plate form. Immersion of this material in the experimental cell of pure gold gave readings of 90 microamperes. In this same cell, freshly prepared amalgam from the same cuttings but well freed of excess mercury registered 10 to 2 microamperes, while amalgam taken from old fillings registered from 4 to zero, all constant readings. It is likely, therefore, as has been brought forth by Weikerd in his studies on the compatibility of Randolf's metal, that the greatest source of chemical decomposition, to which electrogalvanics is allied, in connection with alloys, is faulty mixing of the elements, so that true alloying does not really take place. In the case of amalgam, complete amalgamation does not occur, a homogeneous structure actually not existing, but rather islands of amalgam in a matrix of mercury.

CASE 3.—No. 607, girl, aged twelve years, wearing a black vulcanite base plate with an anterior section of gold palladium alloy. The patient began to complain at the outset of a metallic taste and nauseated feeling if the appliance was worn all the time except at mealtimes. She was instructed to wear it at night only, which seemed to relieve the complaint. Readings of 5 microamperes were obtained between the anterior section and a mandibular lingual appliance, and also between the anterior section and large amalgam fillings in the mandibular first molars.

To summarize, a great diversity of current intensities has been observed in mouths containing orthodontic appliances and dental restorations, which because of their ubiquitous nature must be considered together in this study. An absence of striking signs and symptoms similar to those described by previous medical examiners as being specifically due to this cause, has been noted. Whether the intensity of the current is the greatest influence in producing local lesions and systemic disturbances is still an unsettled matter. Work is now in process on animals in an effort to draw definite conclusions in this respect. In

the light of the positive findings of other observers, it is wise to aim for homogeneity in the composition of orthodontic appliances, and to select filling materials that are not likely to set up these electrogalvanic currents. It is clearly our duty to give this problem our keenest attention and to compile enough clinical data to establish conclusive standards of compatibility for the choice of metals to form the appliances. It is certainly likely that special observation will disclose a greater number of lesions than was previously noticed, and from their incidence a sound perspective will be developed.

Indebtedness is acknowledged to Professor H. E. Reilley of the Department of Physics at McGill University for guidance and the loan of instruments in this work. Further findings will be reported at a later date.

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SURGERY IN RELATION TO ORTHODONTIA AND FACIAL HARMONY*

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IT IS proposed here to discuss some of the surgical procedures that are used either in conjunction with or independent of orthodontia in giving a harmonious appearance to the various parts of the face as well as improvement in function, where there have been disturbances originating in developmental factors, injury or disease. Many cases belong purely to the field of orthodontia, others are entirely surgical, but there is a large group which demands close cooperation of the two specialties in order to obtain the best results.

CONGENITAL ANOMALIES OF THE JAWS

Cleft Lip and Palate.—The commonest group of congenital facial anomalies is that involving clefts of the lip and palate. I shall merely touch upon a few of the principal points bearing on facial symmetry and harmony. The correct placing of the premaxilla is the most important factor here. In a complete cleft through the alveolar process and lip, whether single or double, the premaxilla is almost always out of position. Some operators have advocated the immediate surgical mobilization of this bone, forcibly placing it in line with the rest of the alveolar ridge, fixing it there with wires. The difficulty here has been to know just where this correct line is, and many times the premaxilla has been placed too far back, with resulting flat upper lip and distal relationship of the maxillary incisor teeth. I believe that natural processes are capable of establishing this line far better than the surgeon; consequently, I practice what is

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analogous to an orthodontic procedure, viz., closing the cleft in the lip and allowing the natural pressure of the soft tissues of the lip to mold the bone gradually to its proper alignment. Much of the work of the orthodontists in cleft palate cases consists in correcting the dental irregularities and underdevelopment of the maxilla resulting from these early bone operations. Very early operations on the hard palate, whether involving shifting of bones as in the Brophy operation, or involving the soft tissue covering alone as in the von Langenbeck operation, frequently result in arresting the development of the maxilla and in displacement of the dental organs. By limiting the early operation principally to closure of the lip and nostril cleft and by postponing the hard and soft palate closure until the patient is at least three years of age, the growth of the maxilla will in most cases not be retarded, and extensive orthodontic procedures will generally be unnecessary. Of course minor irregularities of incisor teeth are present in most cases of cleft palate, no matter how treated. Very disastrous effects are seen after complete removal of the premaxilla, which has been advocated by certain surgeons in cases of marked forward displacement. The upper lip is flat, the lower lip is apparently protruded, and there is a permanent opening in the anterior part of the palate. Correction can only be obtained by means of a prosthesis.

Other Congenital Anomalies of the Jaws.—There are certain malrelations of the dental arches and jaws which are not definitely the result of known disease or injury. In some of these there are marked malocclusion and irregularity of the teeth, while in others the dental relationships are satisfactory as far as function is concerned, and relief is sought on account of the disfigurement. The majority of cases associated with malocclusion of the teeth are of course amenable to orthodontic treatment if treatment is begun during the earlier stages of development. However, in some of the more marked, completely developed cases of protrusion of the mandible (macrognathia) (prognathism), open-bite, and underdevelopment and retrusion of the mandible (micrognathia), surgical intervention is required to afford relief.

Protrusion of the Mandible.—The first surgical operation on record for the correction of protrusion of the mandible was done by Hullihen, of Wheeling, West Virginia, in 1848.[6] Several operative procedures have been suggested, and in selection one must be guided by the peculiarities of the individual case. It would appear logical in many cases to section the jaw somewhere behind the last molar on each side, as the operation can often be done without entering the mouth, thus limiting infection, and also because the body of the bone can then be slid back as a whole to bring about good relationship of the teeth, without actual removal of any bone. Dufourmentel[4] of Paris advocates removal of both mandibular condyles, and states that after this it is possible to move the mandible backward from 1 to 2 cm. Dufourmentel's operation has the disadvantage of frequently being followed by open-bite, which requires secondary correction. I attempted correction in one case by Dufourmentel's method but was unable by this means to reduce the protrusion sufficiently, and a second operation had to be done. Babcock of Philadelphia[1] probably was the first to correct this deformity by a horizontal section through the ascending ramus on each side. A more recent

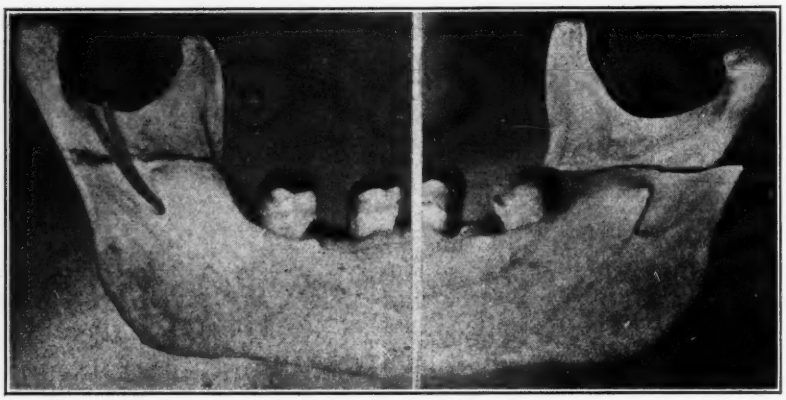

Fig. 1. Fig. 2.

Fig. 1.—Showing where horizontal section of ramus of mandible can be made without injuring inferior dental nerves and vessels.

Fig. 2.—Body of mandible carried back after horizontal section through each ramus.

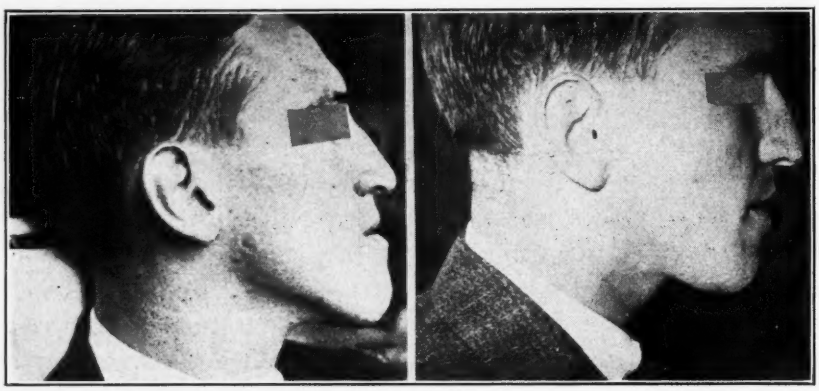

Fig. 3. Fig. 4.

Fig. 3.—Case of protrusion of mandible, before operation.

Fig. 4.—Same case after horizontal section through each ramus and carrying entire body of bone backward. Note inconspicuous operative scars.

Fig. 5. Fig. 6.

Fig. 5.—Same case as Figs. 3 and 4. Casts showing occlusion before operation.

Fig. 6.—Same case as Figs. 3, 4, and 5, after operation.

description of this operation, illustrated by nine case reports, is given by Kostecka, of Prague.[7] By dividing the ramus sufficiently high it is frequently possible to avoid injury to the inferior dental nerve and vessels (Figs. 1 and 2). A specially curved pedicle needle, devised by Blair,[2] is necessary to introduce the pilot suture for carrying a Gigli saw around the inner surface of the bone. The needle forms nearly a half circle 4 cm. in diameter, and it is important that the curve extend up to the point, which is rather blunt and provided with an

Fig. 7. Fig. 8.

Fig. 7.—Case of open-bite, before operation. Posterior teeth are in occlusion.
Fig. 8.—Profile of patient shown in Fig. 7.

Fig. 9. Fig. 10.

Fig. 9.—Patient shown in Figs. 7 and 8, after section through each angle of mandible, permitting backward displacement of body of bone and closure of bite.
Fig. 10.—Profile of open-bite, after operation.

eye. The needle is introduced through a small incision about 2 cm. above and behind the angle of the mandible. The point of the needle is kept close to the bone on the inner surface of the ramus and emerges through a small incision in the cheek at the anterior border of the ramus. A silk thread is passed through the eye of the needle, and this in turn pilots a Gigli saw, by which the ascending ramus is sectioned horizontally between the inferior dental foramen and the sigmoid notch. The ramus being divided on each side, it then becomes possible

to push back the main body of the mandible until the desired occlusion of the teeth is reached. The maxillary and mandibular teeth are then fixed in occlusion with suitable splints or ligature wires for several weeks until union of the fractures takes place (Figs. 3-6).

In some cases of protrusion of the mandible it is preferable to remove a section of bone from each premolar region. This is especially suitable when premolar teeth are already absent and do not have to be sacrificed. It has the disadvantage that the mucous membrane of the mouth generally has to be opened, thus leading to infection, and two cuts in the bone are necessary on each side instead of one as in the ramus operation. One of the best articles on bilateral resection of the horizontal portion of the mandible for protrusion is by Schultz.[11] He gives very complete references to the literature. This method has also been recently described by Henschen and Schwarz, of Basel,[5] and by Pichler, of Vienna.[10] A sufficiently accurate idea of the amount of bone to be removed can be gained by a study of the plaster models of the mouth. Before the operation, fixation appliances should be made and attached to the teeth. When enough teeth are present, the maxillary and mandibular teeth can be fastened in occlusion by wire ligatures or arches after the operation. In other cases special interdental splints may have to be made. Frequently, teeth are absent in the premolar region, or there may be sufficient space to render unnecessary the sacrifice of teeth in the excised bone segments. Attempts have been made to remove the bone submucously without entering the mouth, and also to preserve the continuity of the inferior dental nerve and vessels. It is practically impossible to accomplish this in most cases. Consequently, there is no great objection to extracting any teeth which lie in the segment of bone to be removed, at the time of the operation.

Open-Bite.—In open-bite there is usually some protrusion of the chin also. When the mouth is closed as far as possible, it is found that the posterior molars alone are in contact, while the maxillary and mandibular incisors are found to be a varying distance apart. In most cases the angle of the mandible is found to be very obtuse, in fact the body and ascending ramus may be almost in a straight line. By dividing the mandible through the angle with a Gigli saw on each side, the angle can be converted more nearly to a right angle, the chin raised, and the anterior teeth brought into occlusion. Fixation in occlusion is maintained for six to eight weeks until union of the bone is complete (Figs. 7-10).

Retrusion or Underdevelopment of the Mandible.—In some of these cases the mandibular teeth are in retroclusion, while in others the occlusion of the teeth is satisfactory but the deformity consists in an underdevelopment of the bone in the region of the chin.

In the cases with retroclusion of the teeth, not amenable to orthodontia alone, the body of the mandible can be brought forward as a whole after horizontal section through each ascending ramus (Fig. 11), and fixed in the forward position by means of the teeth until union in the new position occurs (Figs. 12 and 13). In other cases it may be better to make the section through the body of the bone in the molar or premolar region on each side, hold the chin segment forward by dental fixation until healing occurs, and then restore any defect in continuity by bone grafting.

In cases without malocclusion, the desired prominence of the chin can be given by implanting in front of it a graft of costal cartilage or bone from the crest of the ilium.

Over- and Underdevelopment of the Maxilla.—In some cases of apparent underdevelopment of the mandible, the real disturbance of harmony may be that the alveolar process of the maxilla anteriorly may lie too far forward. If this cannot be corrected by orthodontic measures, then it may become necessary to

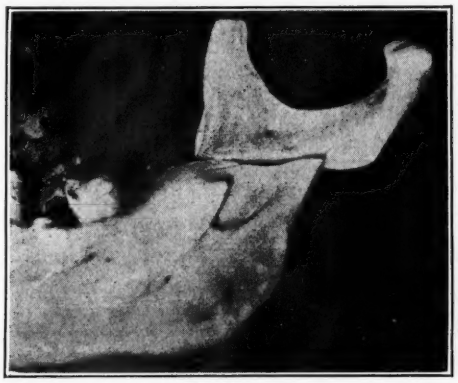

Fig. 11.—Body of mandible brought forward, after horizontal section through ramus, in case of underdevelopment of mandible.

Fig. 12.

Fig. 13.

Fig. 12.—Casts of case of underdevelopment of mandible, before operation.

Fig. 13.—Same patient as shown in Fig. 12, after chin has been brought forward following horizontal section through rami. Note incisions for passage of Gigli saw around the bone. Case will be completed by removal of maxillary anterior teeth and alveolar process and insertion of maxillary artificial denture.

extract the maxillary teeth as far back as the premolars, to trim off some of the alveolar process, and to insert an artificial denture. In underdevelopment of the maxilla, in certain cases Blair[3] makes an incision beneath the upper lip, frees all of the soft tissues of the cheek from the bone, and advances all of these tissues by suturing them in a forward position under the lip. In other cases, the deficient maxillary tissues must be replaced by artificial intraoral substitutes.

FACIAL ASYMMETRY AND DISHARMONY DUE TO DISEASE AND INJURY OF THE JAW BONES

Marked asymmetry of the face may result from a loss of bone from one side of the mandible as a result of osteomyelitis, from shortening after a fracture, or from retarded growth after injury near the condyle in infancy. This is a distinct deformity, occasionally seen in children. It generally follows osteomyelitis of dental origin with necrosis of a complete section of the lateral portion of the bone. After the sequestrum has been thrown off and the tissues have healed, there is either a gap in the bone filled with scar tissue or a shortening of the bone on one side. The patient's appearance resembles that of one with ankylosis of the mandibular joint, although the mandible is usually freely movable. The main portion of the mandible swings over toward the gap, with consequent deviation of the chin to the affected side, and there is a recession of the chin in profile. The mandibular anterior teeth are far posterior to corresponding maxillary teeth. The abnormal side of the face presents a rounded appearance, due to vertical shortening of the bone and bunching up of the overlying soft tissues, and the sound side of the face is flattened. As the child grows older, the deformity is accentuated, owing to lack of development of the chin from disuse of the mandible. In cases of osteomyelitis this deformity can often be avoided to a considerable degree by proper management during the osteomyelitis stage. Fixation of the sound part of the jaw by splints attached to the teeth to maintain correct occlusion during sequestration should be done if possible, but this may be difficult on account of the immature condition of the dentition and the small number of teeth present as points for retention. In cases of injury early recognition of fractures and proper care will do much to prevent this deformity.

In a case presenting facial asymmetry due to unilateral shortening of the mandible, a radiographic study is made to determine, among other points, the amount of bone lost. Study models are made of the maxillary and mandibular teeth, to see whether these can be made to occlude by manipulation of the casts. If there is a great discrepancy between the maxillary and the mandibular dental arches in the corrected position of the casts, due to abnormal tooth movement as distinguished from abnormal position of the mandible as a whole, it is often helpful to attempt to secure better tooth relationship by orthodontia before performing the corrective bone operation. If the teeth can be brought into fairly correct relationship by manipulation of the casts, indicating only an abnormal position of the entire jaw, reduction of the deformity by operation on the bone is indicated. The operation consists in freely mobilizing the mandibular fragments by section of the fibrous tissue between them so that correct occlusion can be restored. Where a bony union is present, it must be divided with a Gigli saw. After the bone has been thoroughly mobilized at the point of section, the chin is drawn forward and to the median line, and fixed in position by appliances on the teeth. If retention by the teeth is precarious, attachment may be made more secure by the use of circumferential wires around the bone itself. After this first operation, a waiting period of six to eight weeks follows, for healing to occur. It is essential that no restoration of bone by grafting be attempted until the site of the bone defect has been completely healed off from the oral cavity. If

the original loss of bone has been slight, it is possible for spontaneous regeneration to occur to fill the gap, but this is rare. Usually a bone graft is necessary to restore the continuity of the jaw. It is not possible here to give details of bone grafting. In children, the osteoperiosteal method is very satisfactory. In defects of the mandible in adults, I prefer to use a graft from the crest of the ilium. Deformities of the face following resection of mandible for neoplasm can be treated according to the same principles. After restoration of continuity of the mandible in these and other cases, it may be found that facial asymmetry still exists to some extent because of distortion in the shape of the bone. A flattening due to this can often be remedied satisfactorily by implantation of a suitable piece of costal cartilage between the soft tissues and the bone (Fig. 14).

Contracted scars about the neck following burns may bind the chin down to the chest and completely obliterate the normal profile in this region, as well as draw the lower lip down out of position. In extreme cases there is a marked distortion of the mandible itself. Much can be done to restore the profile in some cases by a flap-shifting operation known as the Z-plastic, given to the profession by the late Dr. Stewart McCurdy, of Pittsburgh.[8]

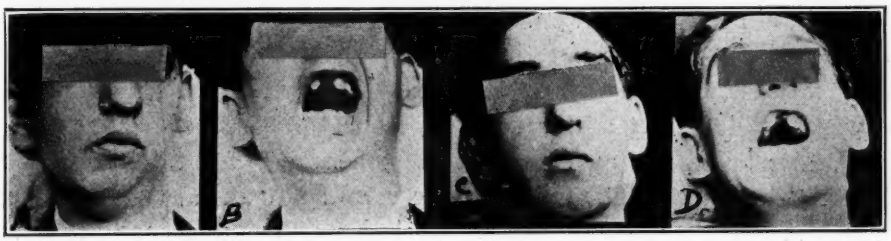

Fig. 14.—Asymmetry of mandible in case of bony ankylosis. *A*, Before treatment; *B*, after operation to free mandibular joint; *C* and *D*, asymmetry corrected by implantation of costal cartilage against bone on left side.

DEFORMITIES OF THE NOSE

There are several ways of classifying nasal deformities. From the corrective standpoint, the two great primary divisions are deformities of *shape*, not involving actual loss of tissue, and deformities in which there is a *deficiency* or loss of tissue.

Deformities of Shape.—Some of these deformities consist of an overgrowth of a part of the nose, e.g., a hump over the bridge in the region of the lower borders of the nasal bones; a broadening of the bridge of the nose accompanied by a hump; a broadening of the lower part of the nose, due to hypertrophy of the greater alar cartilages; a dependent tip of the nose. Every one doing reconstructive surgery of the face is pestered by people suffering from more or less imaginary nasal deformities, and a great deal of judgment is required in the selection of cases which will really be benefited by operation. Before deciding to accept a case of developmental abnormality of the nose for correction, very careful consideration of psychic, economic and other factors must be given. We refuse many more cases than we accept.

Most cases of enlargement of various parts of the nose are corrected through an incision in the vestibule. A hump may be removed from the bridge by freeing the overlying skin through this incision, and rasping off the elevation. In other

cases chisels are used. To overcome abnormal breadth over the nasal bones, it may be necessary to cut free the lateral attachments of the nasal bones with a chisel, permitting them to be pressed together in the median line. In broadening of the lower part of the nose, suitable amounts of the alar cartilages can be removed through a vestibular incision on each side. To raise the tip of the nose, the most satisfactory procedure is resection of a triangular piece from the lower part of the septum just above the columella, the base of the triangle being in front and the apex behind. The incisions pass completely through the septum from side to side and involve the mucosa, the medial crus of the alar cartilage and the septal cartilage. Through-and-through sutures draw up the lower arm of the triangle to the upper, thus raising the tip. For support, a sling consisting of a narrow strip of adhesive plaster is passed beneath the tip and over the dorsum of the nose.

In correction of lateral deviation of the bridge due to displacement of the nasal bones from injury, the approach is the same as for hump nose. With a narrow chisel the nasal bones are freed from their lateral attachments and from the perpendicular plate of the ethmoid beneath, and by pressure manipulated into place in the median line. Usually an impression compound dressing suffices to maintain correct position.

Saddle Nose.—Aside from the developmental hump nose, the commonest deformity of the bridge of the nose is the so-called saddle nose, in which there is a backward displacement of the nasal bones. Depression of the bridge of the nose may also be due to an absence or displacement of the lateral and septal cartilages. These deformities may be the result of trauma, syphilis, operation (submucous resection of the septum), septal abscess, or occasionally they may be congenital. Before correction of the external deformity is undertaken, it is important that internal obstructions to the breathing be removed if possible. There are generally associated with the depression an upward tilting of the tip of the nose and an apparent broadening of the bridge. In the simplest cases there is no loss of tissue, the skin and lining are intact, and the deformity is due to a backward displacement of the bony and cartilaginous structures. Instead of attempting to bring these forward, it is much simpler in long standing cases to insert some supporting substance beneath the overlying skin. There has been much discussion regarding the best material for building out these subcutaneous depressions. At one time paraffin was extensively used, but it should have no place in plastic surgery of the face, being difficult to control in injection, causing unsightly disfigurements, undergoing changes in shape, and it has caused embolism and tumor formation. Celluloid, ivory and other foreign substances have their advocates, particularly in Germany, Austria, and New York. They have the advantage that they are easily inserted without mutilating other parts of the body, but are subject to all the disadvantages of any foreign body, viz., that extrusion is possible at any time. Transplanted bone as a support for the bridge of the nose is employed by some surgeons. It is a well-known fact that a bone graft embedded in soft tissues will usually undergo absorption in time, and for permanency it must be in contact with good bone at each end. This obviously renders it unsuitable as a nasal support in most cases. Also the slightest infection will lead to loss of the graft.

Autogenous costal cartilage is by far the most suitable of all substances to build out defects in the bridge of the nose. It is not difficult to obtain in any quantity desired, is easily trimmed to suitable size and shape, and rarely undergoes absorption when imbedded in soft tissues and having once healed in place will never be extruded. The cartilage transplant is not necessarily lost if suppuration occurs. For minor defects over the bridge of the nose, sufficient cartilage may be obtained from the ear through a small skin incision on the posterior surface of the ear under local anesthesia.

For implantation of costal cartilage over the bridge of the nose, I prefer to make a small transverse skin incision over the nasofrontal suture. This results in a practically invisible scar. From this incision the skin is undermined toward the tip of the nose, and a piece of costal cartilage after trimming to suitable size and shape is inserted. A few fine sutures close the incision (Figs. 15 and 16). In cases where the depression is of minor extent and especially where it concerns the lower part of the bridge, the skin incision may be made transversely just beneath the tip of the nose.

Fig. 15. Fig. 16.

Fig. 15.—Traumatic saddle nose deformity.
Fig. 16.—Same as Fig. 15, after implantation of costal cartilage beneath skin over bridge of nose.

Some cases of saddle nose deformity are complicated by loss of mucous lining as the result of ulceration and scar formation. The skin covering may be quite intact, but the tip is markedly turned up, with the nostrils facing forward. Here it is necessary to supply new lining as well as support. The lining must be supplied first, after freeing the adhesions and removal of scar tissue inside. This can be done either by means of free skin grafts, as described by Sheehan,[12] New[9] and others, or else by inverting a pedicled flap of skin. This first operation will usually bring down the tip of the nose to its normal position, after which the concavity of the bridge is corrected by implantation of costal cartilage.

Deficiencies of the nose involving the covering alone or the deeper parts as well, and varying greatly in extent up to entire absence of the external nose, may result from injury or disease. In minor cases, these may be repaired by free skin grafts, and in major ones, skin and subcutaneous tissue flaps have to be transplanted from elsewhere, preferably from the forehead. A forehead flap

with a pedicle either at the inner third of the eyebrow, nourished by the angular and supraorbital arteries, or at the temporal region, nourished by the superficial temporal artery, is well supplied with blood, is easily maintained in position, and the skin has a texture very similar to that of the normal skin of the nose. A flap of sufficient size can be obtained from the forehead to supply the entire covering of the nose as well as lining the alae and forming the columella.

It has been possible in this short paper only to indicate the principles governing this work, but it is hoped that the illustrations will aid in supplying details.

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AN APPLIANCE ANALYSIS WITH MEASURED PRESSURE

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AS FAR back as 1873, it was realized that excessive pressure slowed up the movement of teeth and also retarded the reconstruction of bone around the tooth in its new position. The root resorptions occurring in orthodontic cases have been laid, not without reason, to excessive pressure. Physiologic pressures have been advised in almost every article on orthodontia in the last several years, and yet, so far as I have been able to ascertain, there is no general conception of the number of ounces that constitute "physiologic pressure," nor at what point, in ounces, that pressure becomes excessive. Apparently no records of pressures used and results obtained have ever been kept; at least none have ever been published so far as I can learn.

The experiments of Oppenheim on baboons, reported in 1911, and also those of Gottlieb and Orban on dogs, reported by C. F. Boedecker in the International Journal of Orthodontia, September, 1932, seem to prove conclusively that when teeth are moved by excessive pressure, it is because of inflammatory rather than physiologic reaction, but both of them report merely the use of "excessive pressure." If one knew just what they considered excessive pressure, it would at least give one some idea of what pressure not to use. It seems that so far orthodontists have known only two pressures, viz., "excessive" and "mild" and have never been able to define either.

If an engineer did not know how many pounds of steam were needed to make his engine do the work required of it or what the safe capacity of his boiler was (in pounds of steam pressure), and, if there was no gauge on the boiler to tell him the amount of pressure that it was carrying, he would soon come to grief. We do not seem to know, even approximately, what pressure is essential to the movement of teeth or just what is a safe limit to pressure that will produce movement without exceeding the "physiologic limits." Neither do members of the profession generally possess a gauge that will enable them to

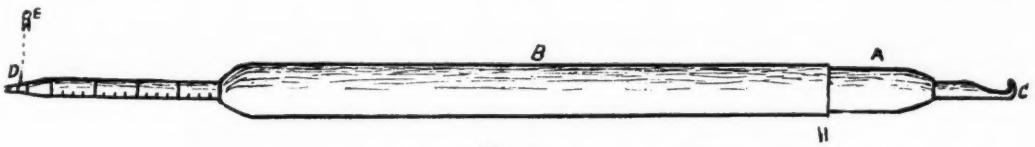

Fig. 1.

know when they are applying the desired pressures even though they had been established. Beyond a doubt we often come to grief because of these lacks, but nothing has been done about it because our grief is not so spectacular as a boiler explosion.

Realizing the need of finding out just how much pressure my appliances were producing, I devised and had made a spring balance that will measure the force exerted by all types and parts of appliances, and its use has been most

Fig. 2.

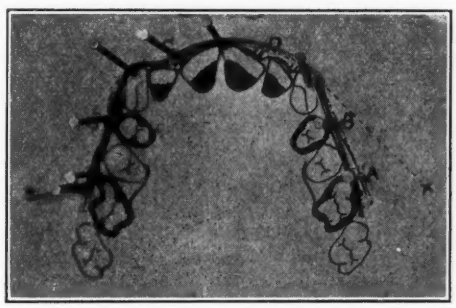

Fig. 3.

illuminating. Not only have I found typical appliances producing stresses greater than I had imagined, but reactions have been traced that were diametrically opposite to what had been expected.

Fig. 1 shows the stress and tension gauge which I use to determine the pressure exerted by orthodontic appliances. The point *D* is placed against the wire in its rest position, and with it the wire is pressed down to the position it would occupy when it was fastened to the tooth. As the shaft *DC* is connected with a compression spring in the barrel *B*, the pressure needed to spring the wire to its working position will press the shaft into the barrel a certain distance and the force exerted is registered in ounces by the calibrations on the shaft. Of course the force needed to seat the wire is the force exerted on the tooth to which it is attached. The hook *C* is useful in testing the force exerted by elastic ligatures

and certain finger springs that are used for pressure rather than tension. The slotted attachment marked *E* is used to test coil springs used in the E. B. Arnold technic.

The instrument shown weighs forces up to 16 oz. I feel that a force greater than 16 ounces is beyond the limits of physiologic pressure. However, it is not powerful enough to measure the pressures found in many appliances.

Fig. 2 shows a picture of a so-called laboratory appliance which is not different in principle from many appliances shown in textbooks and case reports. This is not a criticism directed at this appliance at all but, merely because it shows the position of the arch wire at rest as well as in action, it offers an opportunity for analysis that will prove that the pressure exerted by many appliances

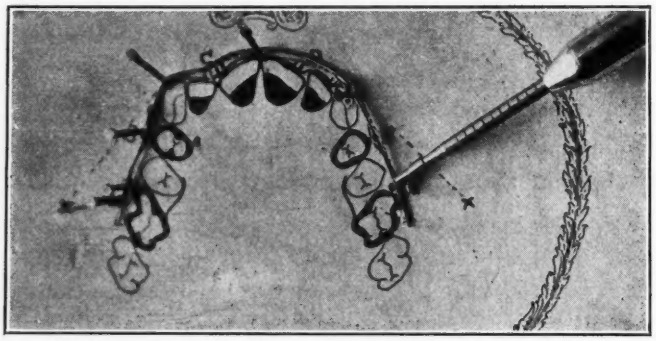

Fig. 4.

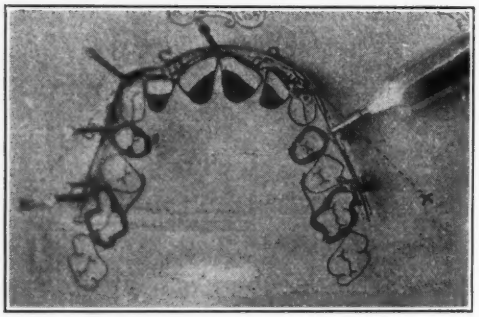

Fig. 5.

is greater than most orthodontists suppose, and, moreover, the direction of pressure is often different than planned.

I assume that the dotted line in the picture indicates the position of the wire at rest, after the ends have been seated in the buccal tubes on the molars.

In order to get a practical demonstration, a cut exactly like Fig. 2 (Fig. 3) was fastened to a board and brads were driven into it so as to hold the arch wire immediately over its pictured position in the buccal tube on the right molar. Brads were also driven at the points where the pictured arch rested on the teeth. The line *X* was also added to the picture to indicate what I assumed was the position that the arch wire would have taken if not held by the buccal tubes on the molars. Certainly the wire would have been given some such position in order to cause a buccal pressure on the molar, as it is apparent that the arch wire is meant to develop the width of the arch, otherwise the lingual extension to the second premolar would be without reason.

A ribbon arch was then adapted so as to lie on the line indicating the position of the arch wire at rest as shown in Fig. 3.

Fig. 4 shows the pressure gauge exerting a force of 6 oz. to spring the end of the arch wire into its position in the buccal tube on the left molar. When fixed in this position by insertion into the buccal tube, it is evident that it would exert a buccal pressure of 6 ounces on the molar.

Fig. 5 shows the arch wire held in position as though it were in the buccal tube, by brads driven into the pictured walls of the buccal tube. It also shows the pressure gauge exerting pressure greater than 16 oz. to force the wire down to its attachment to the first premolar. At that it does not quite reach the point indicated by the cut.

A brad was then driven to hold the wire in its position as though attached to the premolar band. No one who has watched this experiment to this point has been able to guess what the action on the molar would now be. The general opinion has been that there was still a buccal pressure on the molar. That is

Fig. 6.

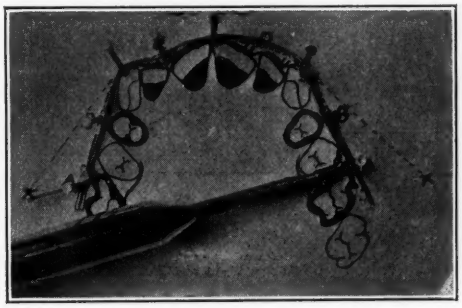

Fig. 7.

apparently what the designer of the appliance thought. However, when the brads representing the molar tube were removed, the distal end of the wire was found to spring lingually as shown in Fig. 6. In other words, what had started out as a buccal pressure of 6 oz. had now developed into a lingual pressure of 8 oz.; Fig. 7 shows that it took a pressure of 8 oz. to move the wire back to its position in the buccal tube.

The brads were then replaced to hold the wire in position on the molar, and the pressure gauge was used to press the wire down to its attachment to the right central and lateral incisors. The regular gauge was found to be entirely inadequate for the task, and a gauge with a heavier spring was constructed. The capacity of this gauge was 4 pounds, but it was found to be not quite sufficient to carry the wire to the position indicated. Of course this pressure was divided between the two teeth, making something over two pounds on each tooth. Even though we do not know just when a pressure becomes excessive, I feel that orthodontists generally will consider that this one is.

No attempt was made to measure the pressure on the left central and lateral incisors, but, due to the short bend over the mesial of the lateral incisor, there would be a somewhat greater pressure than on the right unless the elastic limit of the wire was exceeded and a permanent bend produced.

Of course these figures might be somewhat greater or somewhat less according to the composition of the wire and whether it had been annealed or heat treated.

If a 0.036 (19 G.) wire had been used in place of the ribbon arch, all of these figures would have to be multiplied by four. A 0.030 wire would multiply them by three. Even a 0.020 (24 G.) wire, which is probably too light ever to be used as a full arch wire, would produce a 16 oz. pressure if sprung as shown in the region of the right central and lateral incisors.

Regardless of the kind of wire used, the resulting pressure on the molar would be lingual and not buccal as intended.

In the matter of deceptive direction of pressures, I find that they have sometimes been noted in lingual arches. Fig. 9 is taken from page 202 of McCoy's *Applied Orthodontia* (1922) and shows how a lingual arch wire, meant to expand the whole arch, may have an actual contracting force if it bears too heavily on a lingually posed incisor. It seems improbable that the same tendency was recognized in buccal arches because numerous expansion arches are shown in the

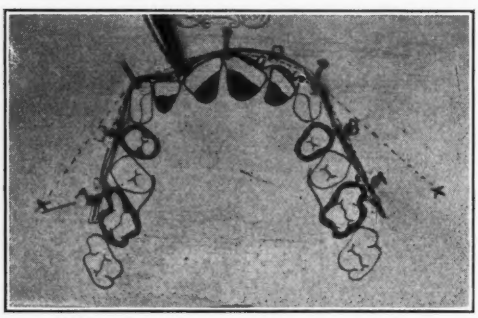

Fig. 8.

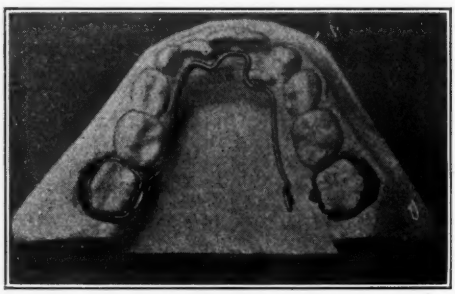

Fig. 9.

same textbook with ligatures to the premolars, and there is nothing in the text warning against creating so much pressure with the ligatures as to overcome the buccal spring of the arch.

Of course an appliance cannot move a tooth a greater distance than the distance that a wire is sprung in creating the pressure that causes the movement; so the more resilient the wire the greater the movement that can be obtained by each adjustment without having an excessive initial pressure.

For instance, if it were decided that 10 ounces were the limit of physiologic pressure, wires of various gauges might be sprung the distances indicated below and create only a 10 oz. initial pressure.

0.036 (19 G.)	1-200 inch
0.030	1-120 inch
0.020 (24 G.)	1-25 inch
Ribbon arch	1-75 inch

These figures are for an arch wire resting on two points the distance apart of the mesial margin of the central incisor and the prominence of the canine as shown in Fig. 2. The longer the span between the points of rest, the greater will be the spring to produce a given pressure.

Beyond a doubt many of the more proficient operators have worked out a "feel" of pressure that enables them to keep the tension they use at the proper

level for best results. However, having no unit of pressure, they are unable to transfer the knowledge that they have gained by years of experience to the young students of orthodontia, so the new man has to start, in the matter of pressures, where his predecessor started and learn by bitter experience. When once a unit of pressure is established and the limits of desirable pressure are known, each generation may stand on the shoulders of the one before and start where it left off. Then our progress will be greatly accelerated.

FLEXIBILITY STUDIES ON GOLD ALLOY WIRES AND ORTHODONTIC APPLIANCES*

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(*Continued from p.* 794.)

II. REFLEX SPRINGS AND PRACTICAL APPLIANCES

IN THE following analysis of the results on recurved springs, it will be observed that springs of only one wire diameter were investigated. This is likewise true for heat treatments where all springs were formed from wire in the original condition as received from the factory. This was done with the thought that estimations of values for wires of other diameters and for wires given varying heat treatments could be made, in a general way, from the results obtained and reported for changes in simple cantilever springs. With relations clearly established for the simple springs, it may be expected that they will also hold, at least relatively for the slightly more complex recurved springs.

Brumfield[5] has derived equations to represent the displacement produced in these recurved springs. Expressions have been derived for both the recurved springs having concentrated load at some one point and also for recurved springs having a uniform load on the free arm. In studying these equations for recurved springs, it is to be noted that in their final form they may be directly related to equations for corresponding simple cantilever springs simply by multiplying the equation by a constant factor. This constant depends for its value upon the relative length of the two arms of the spring.

Brumfield has used these equations in calculating the displacement of differently designed and loaded springs. In general, the calculations of Brumfield agree with the observations made in this study, although most of his calculations have been made for the safe maximum load that may be applied to the spring.

In this study the method of measuring the displacement of simple recurved cantilever springs with concentrated load is shown in the photograph

of Fig. 14. In Fig. 15 is shown a practical case appliance similarly loaded, which emphasizes the usefulness of this method of testing.

The spring was supported by a pin vice clamped to the stand, as shown in Fig. 14. A tube was used to hold the spring in position rather than clamping it directly in the pin vice. By slipping the spring through the tube, then compressing the sides of the tube with pliers, the spring was held firmly in a

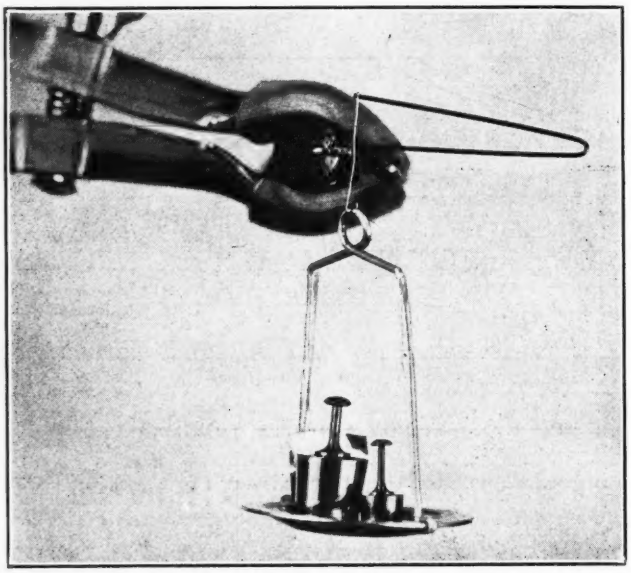

Fig. 14.—Simple reflex spring displaced by load on free end.

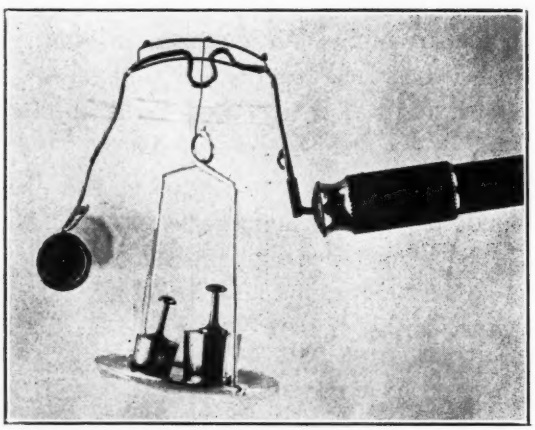

Fig 15.—Practical appliance displaced by load placed in center of free arm.

position convenient for testing. The load was applied to the free arm at a measured distance from the recurved end by means of the weighed basket as indicated. Displacement readings were taken at the point of load application as described for simple cantilever springs. By means of the tube arrangement for clamping, it was possible readily to change the length of the clamped limb of the spring. This facilitated measurements of displacement changes when varying the length of both arms of the recurved appliance.

TABLE VII

(SEE FIGS. 16 AND 17)

MM. LENGTH CLAMPED ARM	MM. DISPLACEMENT (0.018 INCH WIRE)		FREE ARM 0 MM.	LOAD IN GRAMS		FREE ARM 30 MM.
				FREE ARM 10 MM.	FREE ARM 20 MM.	
	0 & 10	20 & 30				
10	0	0	0.0	0.0	0.0	0.0
	0.2	0.5	16.3	9.3	2.8	0.9
	0.4	1.0	28.3	16.6	4.9	1.6
	0.6	1.5	43.3	24.0	7.8	2.4
	0.8	2.0	58.3	33.8	9.9	3.2
	1.0	2.5	70.3	41.5	12.8	4.1
		3.0			15.3	4.9
		3.5			18.0	5.6
		4.0			—	6.4
20	0		0.0	0.0	0.0	0.0
	0.5		5.0	12.8	2.2	0.8
	1.0		9.6	23.3	4.9	1.4
	1.5		14.3	35.3	7.3	2.2
	2.0		18.3	45.8	9.8	2.9
	2.5		22.3	57.8	11.9	3.9
	3.0		—	—	—	4.4
	3.5		—	—	—	5.2
	4.0		—	—	—	5.9
30	0		0.0	0.0	0.0	0.0
	0.5		1.6	3.4	3.7	0.7
	1.0		3.0	6.5	6.8	1.4
	1.5		4.5	9.8	10.4	2.2
	2.0		6.1	13.0	13.6	2.9
	2.5		7.6	16.3	17.3	3.7
	3.0		8.9	19.3	20.6	4.4
	3.5		10.5	22.8	—	5.1
	4.0		11.8	—	—	5.8

In the study of these simple reflex cantilever springs with one concentrated load, only wire of 0.018 in. diameter was tested. The springs were all formed by cold bending around 0.045 in. diameter wire. This gave a radius of curvature in the recurved spring that is somewhat less than that stated by Brumfield[5] as being a safe value for the bend from a structural standpoint. However, inasmuch as the actual normal pressures produced in the appliances are somewhat less than the values indicated from Brumfield's calculations for the maximum allowable pressures, it is not considered that the radius of curvature is dangerously small.

In Table VII are given values for the loads necessary to produce unit displacements in simple recurved cantilever springs with concentrated load. In the left-hand column of this table are given values of the length of the clamped arms on the springs tested. Horizontally from these values are given the values for displacement and load in grams for changes in length of the free arm of the spring.

The data of Table VII have been plotted in two sets of graphs, Figs. 16 and 17. Fig. 16 is plotted to show readily the effect of changing the position of the load on the free arm while the clamped limb remains unchanged in length, i.e., in Fig. 16*A* five positions of loading have been measured on the

spring with a 30 mm. clamped arm. These loads have not been applied simultaneously but rather as single concentrated loads at the positions indicated. Fig. 17 shows the same data plotted to emphasize the effect of changing the length of the clamped limb while the load is concentrated at one position on the free arm. It is interesting to note the little influence produced by changing the position of clamping of a spring loaded at the free end, 30 mm. from the curve. This is shown best in Fig. 17*D*. Until the clamped arm becomes longer than the free arm of the spring, there is no change in pressure produced by unit displacement.

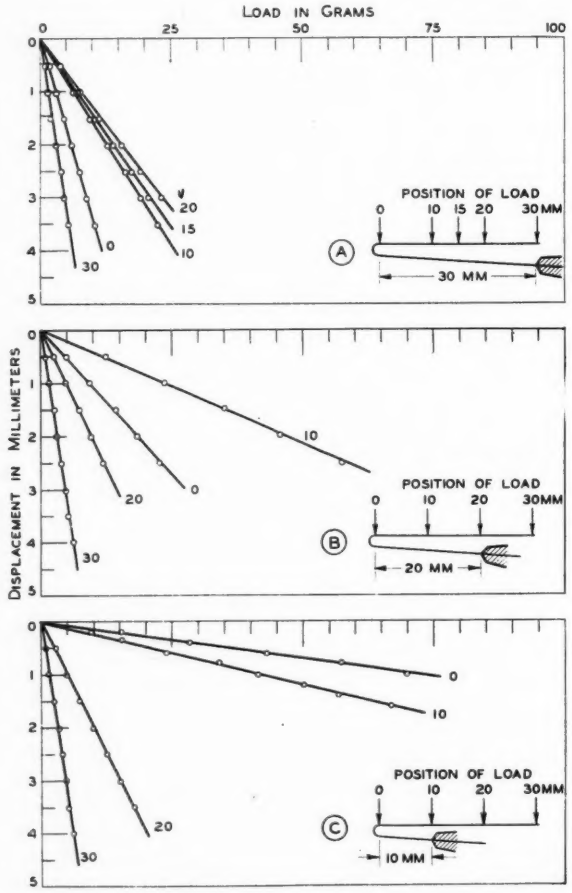

Fig. 16.—Influence of changing length of free arm in a reflex spring using a single concentrated load.

It has been pointed out that breakage may occur at the soldered joint because of incorrect structural design and position of the soldered joint with respect to the dimensions of the appliance.[5] On this basis it is to be judged which is the most satisfactory spring illustrated in Fig. 17*D*. From the standpoint of load displacement relations, however, it is interesting to note that the force of displacement is constant, regardless of the point of clamping.

Brumfield[5] has pointed out correctly that in this type of spring the movement of the end of the free arm, remote from the point of loading, may be in the opposite direction to the direction of movement produced by the load at

the point of application. For example, in a reflex spring with a clamped arm of 20 mm. and a free arm of 30 mm., if a concentrated load is placed on the free end of the free arm, it will produce a downward movement of the point of application, while the curved end of the spring will move slightly upward.

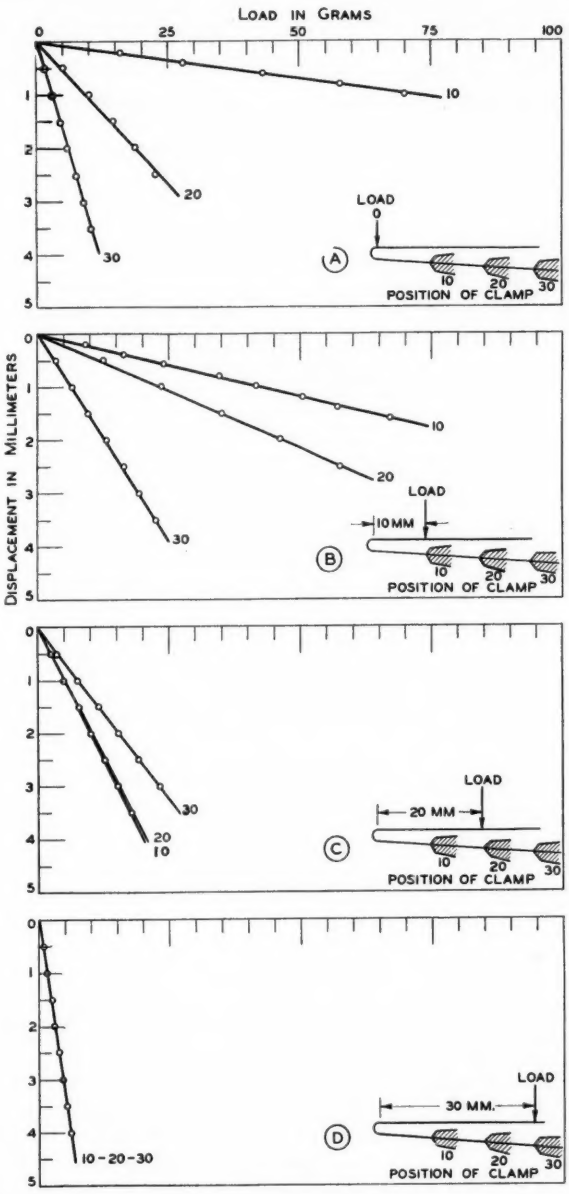

Fig. 17.—Showing effect of changing length of the fixed arm in a reflex spring using a single concentrated load.

The different directional displacements of the opposite ends of the free arm were observed in this study of simple recurved springs with concentrated load, but such values have not been tabulated.

Uniformly Loaded Reflex Cantilever Springs.—In this phase of the study an attempt was first made to produce uniform displacement of a recurved spring by application of loads at three points simultaneously. Obviously, this at-

tempt failed because such a great variety of weight combinations at the three points could be produced, any one of which would give equally well the uniform displacement of the three points. As should be expected, it was therefore demonstrated that two points were all that could be loaded simultaneously and still produce results of any value for uniform displacement of the free arm. To study the effect of load application at more than two points, the method must be, first, to make unit load application, and second, to measure the resulting displacement at the points of application.

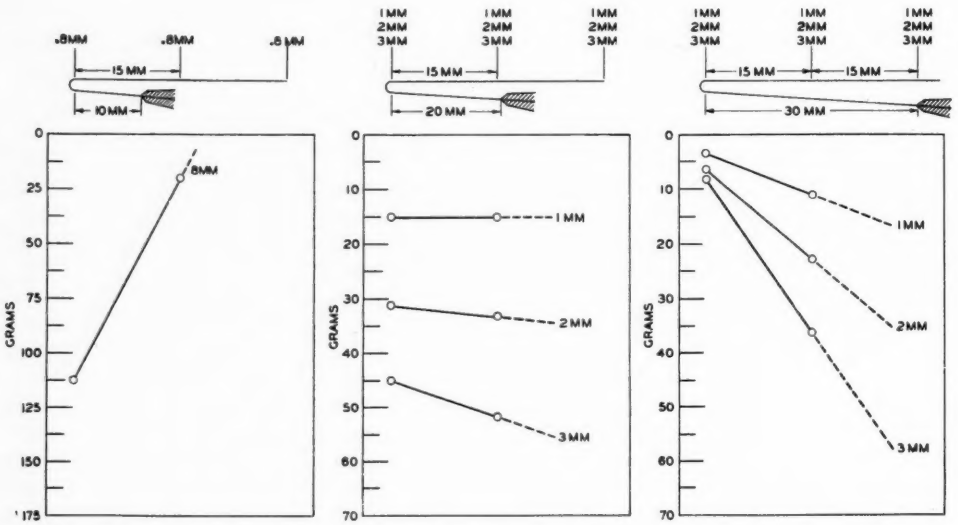

Fig. 18.—Loads required at curved end and center to produce uniform displacement at three points simultaneously.

To produce uniform displacement of the free arm of the spring, only two points may be loaded. This was done on three springs which had different lengths of fixed arms. Loads were applied at the curved end and at the center, which were sufficient to produce uniform displacement in millimeters

TABLE VIII

(See FIG. 18)

MM. LENGTH CLAMPED ARM	MM. DISPLACEMENT AT 3 POINTS	LOAD IN GRAMS		
		CURVED END	CENTER	FREE END
10	0.8	111	20	–
20	1	15	15	–
	2	31	33	–
	3	45	52	–
30	1	3.45	11.1	–
	2	6.45	23.6	–
	3	8.15	37.6	–

along the free arm of the spring. Results of these tests are given in Table VIII and plotted in Fig. 18. From Fig. 18 it is interesting to note that there is a complete change of slope in the curves connecting the points, which represent the loads applied to the two points when the length of the clamped

arm is changed. This shows that the pressures exerted at the two points may vary considerably, depending upon the length of the clamped arm.

The curves of Fig. 18 and all the following curves in this report represent either the load in grams or the displacement in millimeters, of the three points on the free arm of the spring. The points of application are indicated in the diagram directly above the points on the curves. Values of displacement in millimeters or the load in grams are indicated at the left-hand side of the charts. Values of the load applied to the spring are indicated directly above the spring diagram at three points on the free arm. All tests of uniform load application were made on springs of 0.022 in. diameter wire, using wire No. 3.

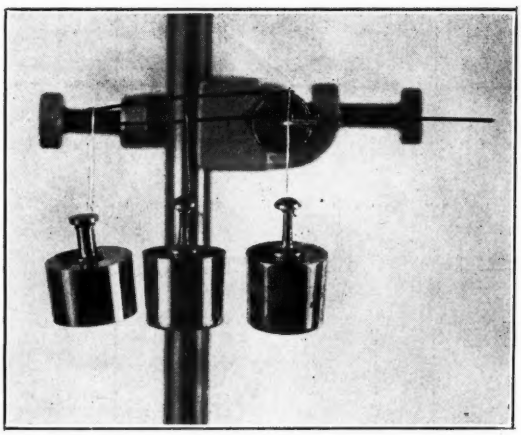

Fig. 19.—Three loads applied simultaneously to a simple reflex spring.

Fig. 19 shows the manner of loading a recurved cantilever spring at several points simultaneously. The displacement produced by these loads was measured at the three points of application by raising or lowering the telescope in the same manner as described for the simple straight cantilever.

TABLE IX

(SEE FIG. 20)

MM. LENGTH SOLDERED ARM	CURVED END		CENTER		FREE END	
	MM. DISPLACEMENT	GRAMS LOAD	MM. DISPLACEMENT	GRAMS LOAD	MM. DISPLACEMENT	GRAMS LOAD
10	0.1	10	0.1	2	0.1	–
	0.2	20	0.2	4	0.2	–
	0.5	50	0.5	15	0.2	–
20	0.4	5	0.4	8	0.6	–
	0.6	10	0.6	11	0.7	–
	0.9	20	0.9	21	1.0	–
30	1.5	5	1.5	19	1.5	–
	3.8	10	3.7	50	4.1	–

Table IX shows the effects of applying unit load to the curved end of the spring, and then adding a load to the center point sufficient to produce approximately uniform displacement in the free arm of the spring. Data from

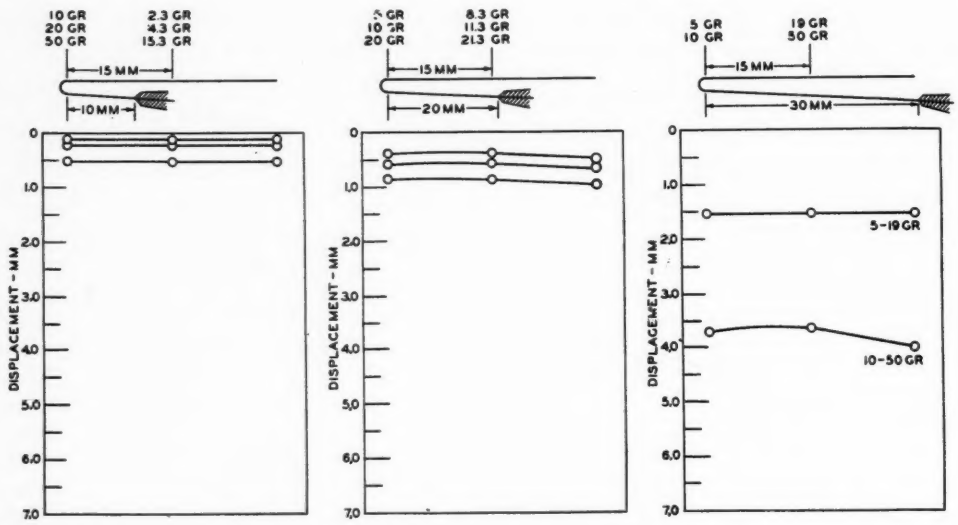

Fig. 20.—Influence of simultaneously adding unit load to curved end with only sufficient load at central point to produce uniform displacement throughout length of free arm.

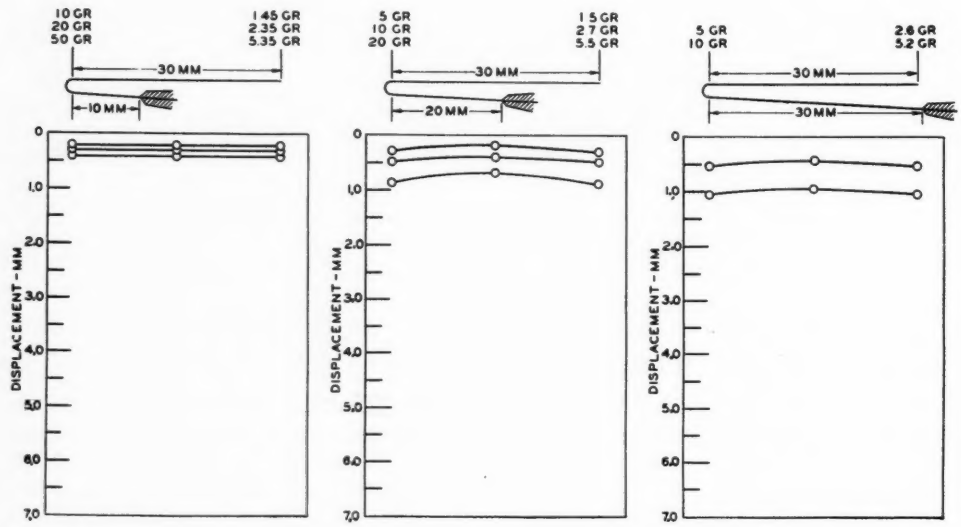

Fig. 21.—Influence of simultaneously adding unit load to curved end with only sufficient load at free end to produce uniform displacement throughout length of free arm.

TABLE X

(SEE FIG. 21)

MM. LENGTH SOLDERED ARM	CURVED END		CENTER		FREE END	
	MM. DISPLACEMENT	GRAMS LOAD	MM. DISPLACEMENT	GRAMS LOAD	MM. DISPLACEMENT	GRAMS LOAD
10	0.2	10	0.2	–	0.2	1.45
	0.3	20	0.3	–	0.3	2.35
	0.4	50	0.4	–	0.4	5.35
20	0.3	5	0.2	–	0.3	1.50
	0.5	10	0.4	–	0.5	2.70
	0.9	20	0.7	–	0.9	5.50
30	0.55	5	0.45	–	0.55	2.6
	1.10	10	1.00	–	1.10	5.2

Table IX are reproduced in Fig. 20. Table X shows a similar spring loaded at the curved and free ends. Results are plotted in Fig. 21 which show that a certain amount of bowing results in the center of the free arm when loads are applied at its two ends. For this reason there could not be produced exactly uniform displacement throughout the length of the free arm.

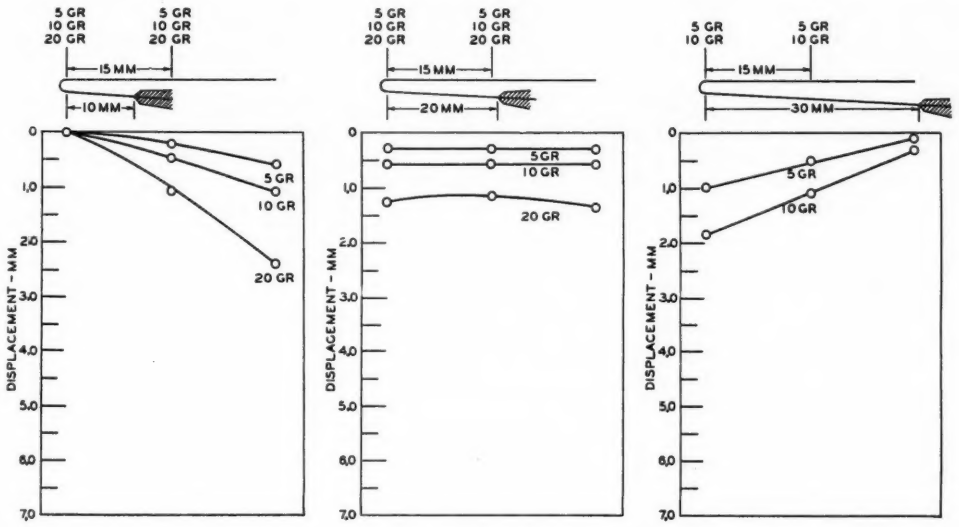

Fig. 22.—Effect of adding simultaneously equal loads to curved end and to central point of free arm of a reflex spring.

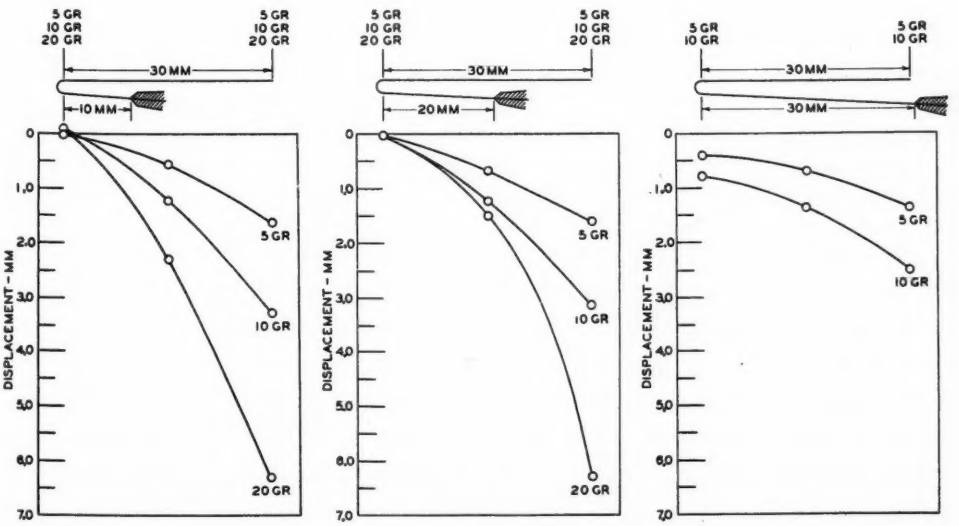

Fig. 23.—Effect of adding simultaneously equal unit loads to curved end and to free end of simple reflex spring.

After studying the effects of applying *unit load to the curved end and observing the load necessary at a second point* to produce uniform displacement at three points on the free arm, it was desirable to study the effect produced by applying *unit load to two points simultaneously* and noting the displacement produced at three points on the free arm. The results of these tests are given

in Tables XI and XII, and plotted in Figs. 22 and 23, respectively. The graphs show clearly the change of slope of the displacement curves connecting the points of load application. A complete change of slope results from changing the length of the clamped arm (Fig. 22). Bowing of the free arm again occurs in the case of the loads being applied to the two ends of the free arm (Fig. 23).

TABLE XI

(SEE FIG. 22)

MM. LENGTH SOLDERED ARM	LOAD IN GRAMS AT TWO POINTS	DISPLACEMENT IN MM.		
		CURVED END	CENTER	FREE END
10	5	0.0	0.2	0.6
	10	0.0	0.5	1.1
	20	0.0	1.1	2.5
20	5	0.3	0.3	0.3
	10	0.6	0.6	0.6
	20	1.3	1.2	1.4
30	5	1.0	0.5	0.1
	10	1.9	1.1	0.3

TABLE XII

(SEE FIG. 23)

MM. LENGTH SOLDERED ARM	LOAD IN GRAMS AT TWO POINTS	DISPLACEMENT IN MM.		
		CURVED END	CENTER	FREE END
10	5	0.0	0.6	1.7
	10	−0.1	1.3	3.4
	20	−0.1	2.4	6.5
20	5	0.1	0.7	1.7
	10	0.1	1.3	3.3
	20	0.1	1.5	6.5
30	5	0.4	0.7	1.4
	10	0.8	1.4	2.6

The study of the effect of load application at two points was followed by an investigation of the application of unit load to three positions on the free arm of the recurved cantilever. This corresponds more closely to a uniformly loaded beam (spring) than in the case of loads applied at only two points simultaneously. Unit loads were placed at each end of the free arm with the same unit load applied at the same time to the center. All of the skeleton springs, as illustrated in Fig. 19, were produced from 0.22 in. wire, formed by bending around 0.045 in. wire to produce a free arm of 30 mm. in each case, while the clamped arm was variable in length. Since no variation could be introduced into the loading or length of the free arm, it was considered desirable to study the effect produced by changing the length of the clamped arm of the spring. The variations studied were between 10 and 50 mm. inclusive. Two wires, Nos. 3 and 5, both 0.022 in. diameter were studied under these same variations and the results have been tabulated in Table XIII. A comparison of the results shows that there is very little difference in the amount

TABLE XIII

(SEE FIGS. 24, 25)

MM. LENGTH SOLDERED ARM	GRAMS LOAD EACH 3 POINTS	DISPLACEMENT IN MM.					
		CURVED END		CENTER		FREE END	
	Wire No. - -	3	5	3	5	3	5
10	5	0.1	−0.1	1.0	0.8	2.3	2.8
	10	−0.1	−0.1	1.9	1.7	4.8	5.0
20	5	0.1	−0.1	0.9	0.9	2.3	2.7
	10	0.0	−0.1	1.9	1.8	4.6	5.3
30	5	0.6	0.7	1.1	1.3	1.8	2.6
	10	1.3	1.4	2.2	2.5	3.8	4.9
40	5	2.7	3.1	2.4	2.8	2.5	2.9
	10	5.6	6.6	4.9	5.9	4.9	5.8
50	5	6.8	7.5	5.2	6.0	3.7	4.4
	10	14.8	16.3	10.9	12.7	7.3	8.8

of displacement produced by unit load in springs formed from either of these two wires. In Fig. 24 is shown more clearly the effects produced by changing the length of the clamped arm. An analysis of the five lengths tested shows that practically no change in displacement of the three points occurs until after the clamped arm exceeds 20 mm. in length. In the case of the clamped arm being equal to 30 mm., evidence of a change in the relative displacement of the three points is shown, while with a length of 40 mm. all three points are displaced practically the same amount. In going beyond 40 mm. the spring again begins to behave similarly to a simple cantilever with a concentrated load at the free end, so that the curve connecting the three points is a straight line, but of a slope directly opposite to that produced in shorter

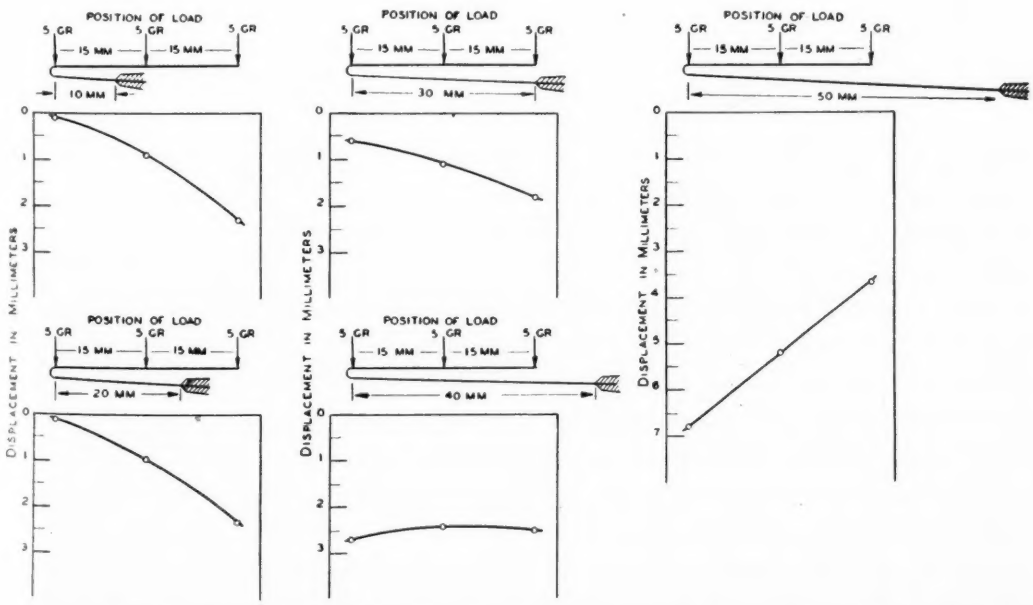

Fig. 24.—Effect of adding simultaneously unit load to three points on the free arm of simple reflex springs using varying lengths of fixed arm.

lengths. This is interesting from the standpoint of being able to apply uniform pressure to several teeth simultaneously with this type of spring, simply by uniform displacement of each point of contact and control of the length of the soldered arm. This will be discussed somewhat more in detail later when considering measurements on practical appliances. In order to make the figure less confusing, one set of values for displacement by unit load has been plotted in Fig. 24, using wire No. 3 as the example. In Fig. 25 values of displacement by two unit loads have been plotted for wire No. 3, using lengths of 10 to 30 mm. inclusive. It is seen that the curves are in agreement, and from Table XIII it may be observed that this uniformity holds over the entire range for both wires studied.

In analyzing the results in Table XIII and Fig. 24 it is seen that if the clamped arm has a value somewhere near one-third greater than the free

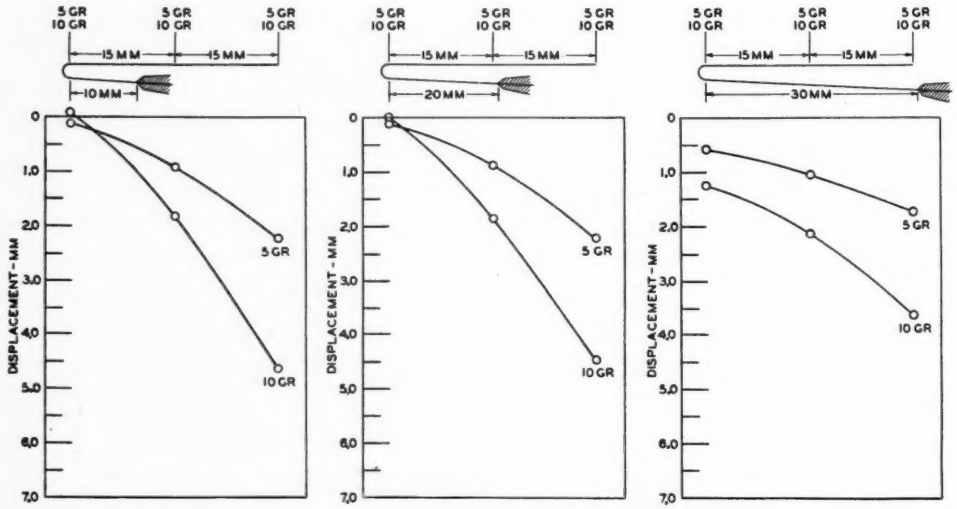

Fig. 25.—Effect of using unit load of different value at three points on the free arm of reflex spring using varying lengths of fixed arm.

arm of the appliance, then uniform displacement seems to occur on application of unit load simultaneously to three points. This observation is also made in connection with the results on practical appliances to be analyzed later. A mathematical verification of this fact has not been made, but experimental evidence tends to indicate that the condition exists. This increase in length may be obtained in the practical appliance by extending the point of soldering back on the main arch until the horizontal distance from the curved end to a vertical line through the point of contact is somewhere near one-third more than the total length of the free arm.

The use of the diagram shown in Fig. 26 will help to make clear the point that as the soldered joint, S, is moved up or down the main arch wire, the length, L, is changed accordingly. In the analysis of the action of this type of spring, it is the total horizontal distance, L, from the curved end to the vertical line, XY, which is effective rather than the total length of the soldered

limb that may be used. It is recognized that this spring design will not be possible in all cases, but in cases where it is possible, an approach may be made to the condition shown in Fig. 24.

Analysis of Certain Designs of Practical Appliance.—The photograph shown in Fig. 27 gives, in some detail, a view of the appliances studied. These are all recurved cantilever springs, uniformly loaded, and having soldered arms

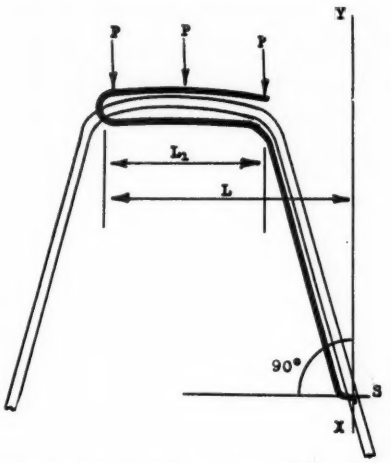

Fig. 26.—Diagram illustrating manner in which the effective length of soldered limb may be increased by soldering far back on main arch wire.

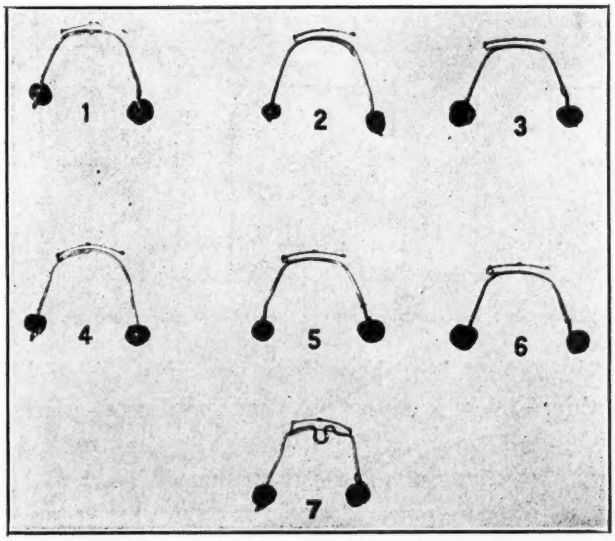

Fig. 27.—Different designs of practical appliances studied.

of varying lengths. Two wires of different diameters were used in these appliances, as is shown in Table XIV which represents the data taken on these springs. These springs were all constructed from wire No. 5 with the exception of appliance No. 7, which was formed from wire No. 1. The appliances were taken as clinical examples and represent structures suitable for application in the mouth. The history of all of these appliances is not entirely known except that appliance No. 7 was in use for corrective purposes until

only a short time before these measurements were made. The reason for choosing this particular series was to study the effect of changing the length of the soldered limb for correlation with Fig. 24. Furthermore, it was desired to study the effect of an Abelson coil in the curved end of these springs as illustrated in appliances Nos. 5 and 6. Wire diameter changes were also included as a part of the study on appliances.

Preliminary measurements were made on actual appliances equipped with simple cantilever springs and recurved cantilever springs with concentrated load, but the agreement of values with those obtained in the skeleton springs already measured and discussed was so close that the results have not been tabulated and presented. The only differences detected in actual values obtained for the practical appliances and the more ideal skeleton structure were

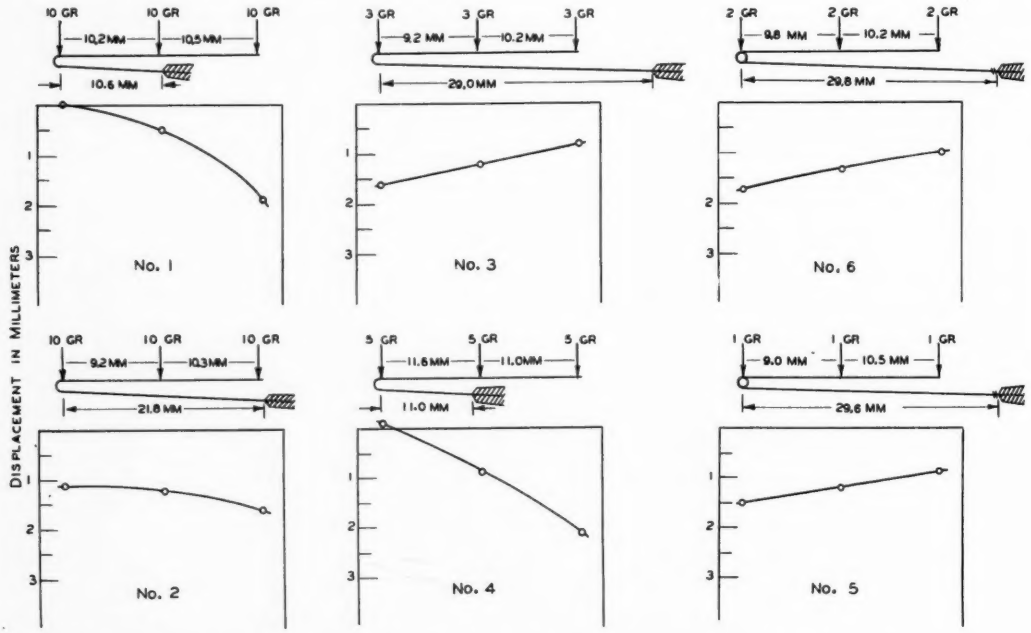

Fig. 28.—Practical appliances: Uniformly loaded reflex springs. Equal loads at three points.

due to variations in spring length or to other dimensions of the appliance. The purpose of Table XIV is to show the very good agreement between values of the uniformly loaded practical appliance and the results obtained from uniformly loaded skeleton springs already discussed (Fig. 24). Actual values are slightly different, but the general and fundamental trend of the results is of the same character. The results given in Table XIV have been plotted in Fig. 28, which shows the displacement produced by unit load at three points on the free arm. The curves for the first three appliances show good analogy to the curves given in Fig. 24 for the change of length of the soldered arm.

It should be explained that the length of the soldered arm was measured as the horizontal distance, L, from the curved end to a vertical line extending through the point of soldering to the arch wire, as in Fig. 26, rather than the actual length of the soldered limb of the appliance. In an appliance of this type, it is the horizontal distance from the solder contact to the sharp curved

part of the spring which is important. Here it is seen that a means of extending the length of the lower arm is obtained by soldering farther back on the arch wire. In this manner length relations are approached that approximate values represented in Fig. 24 for the skeleton appliance.

TABLE XIV

PRACTICAL APPLIANCES

(SEE FIG. 28)

SPRING NO.	GR. LOAD AT EACH POINT	DISPLACEMENT MM.			DIMENSIONS OF APPLIANCE				
		CURVED END	CENTRAL POINT	FREE END	WIRE DIA. INCH	FREE ARM MM.	SOLDERED ARM MM.	CENTRAL POINT: MM. DISTANCE FROM FREE END	CENTRAL POINT: MM. DISTANCE FROM CURVED END
1	5	0.0	0.4	0.9	0.022	22.4	10.6	10.5	10.2
	10	0.0	0.5	1.9					
2	5	0.6	0.6	0.8	0.022	21.0	21.8	10.3	9.2
	10	1.1	1.2	1.6					
3	1	0.5	0.4	0.3	0.022	21.4	29.0	10.2	9.2
	2	1.0	0.8	0.6					
	3	1.6	1.2	0.8					
4	2	0.2	0.4	0.9	0.018	23.0	11.0	11.0	11.6
	5	−0.1	0.9	2.1					
5	1	1.5	1.2	0.9	0.018	22.0	29.6	10.5	9.0
6	1	0.8	0.7	0.5	0.022	21.7	29.8	10.2	9.8
	2	1.7	1.3	1.0					
7	5	1.0	1.1	1.4	0.018	21.4	22.4	10.5	9.0

In Table XIV are also given results to show the effect of placing a coil in the curved end of the spring, as illustrated in appliances Nos. 5 and 6. These auxiliary springs are also wrapped around the arch wire at the soldered attachment. Effects of these modifications may be noted by comparing the results with those on appliance No. 3.

Other practical spring designs were not studied, since no analysis had been made of a corresponding skeleton or ideal spring for comparison. This might be valuable as a future study. It is believed, however, that the fundamentals found to apply to the three general spring conditions investigated will also apply to other spring designs.

The results of this investigation have been presented with a full realization of the fact that changes in the amount of stress will take place from day to day in practical orthodontic treatment as the effects of spring stimulus progress. However, it is believed that work of this kind must be carried on from simple beginnings; while the complex conditions presented by the physiology of the oral tissues can be simulated, if ever, only after relatively elementary mechanical problems are solved.

The experimental work reported in this paper has shown that for practical straight spring appliances the pressures exerted under working conditions are, in general, quite small, being about 25 grams, or a fraction of an ounce. The forces exerted by corresponding reflex springs are, in general, smaller than the forces in simple cantilever springs.

This work has also shown clearly that the cathetometer may be used very satisfactorily to determine the relations which exist between displacement and pressure in orthodontic appliances. The method is very simple and yet quite accurate; it is adaptable to a large variety of cases, so that it should find application in determining pressures exerted by practical appliances of any design.

It should again be pointed out that a large majority of these data were taken on skeleton springs and that these springs were constructed to dimensions approximating most useful appliances in practice. The values for these skeleton springs, however, check the values obtained on actual appliances of similar design. Therefore, for general information concerning the pressures exerted by unit displacement of appliances, values from these data may be accepted as reliable guides to be used in the design of spring appliances.

This investigation has shown that for simple springs there is but very little difference in the pressure values with unit displacement, when using any one of six different wires. Even though the difference in actual pressures exerted by various wires is small, the percentage difference is somewhat larger. As was suggested before, it is believed that further study will be necessary to determine the practical effects of small variations of pressure exerted by different wires.

This condition is likewise true for wires which are given different heat treatments. Over the range tested, well within the elastic limits of the materials, there was no decided evidence of the influence of heat treatment on the wires. This does not say, however, that certain other advantages may not be obtained by heat treating the appliance; it may be definitely true that heat treatment of the appliance is essential. The same statement holds for a choice of any one of the six wires tested. For example, such things as soldering characteristics, ease of manipulation, and formation of the appliance are among other things to be considered in the choice of a wire and heat treatment.

From the tables of data presented it is seen that there is no outstandingly evident relation between any of the more commonly considered physical properties and the property of flexibility. From a theoretical standpoint and from a consideration of equations expressing the relation of displacement to force exerted, a relation does appear evident between the modulus of elasticity of the material and the flexibility of the structure. It is suggested that this should be investigated further to determine more definitely whether this relation exists as indicated from this study.

Findings in this study have suggested that perhaps it might be valuable to investigate these appliances further for the purpose of making comparative determinations of the resilience shown by the structure; that is, to calculate and tabulate the energy that may be obtained from a certain structure and material under given displacement. Correlation of this property of resilience with other physical properties, and especially with the modulus of elasticity, might reveal valuable relationships.

SUMMARY

1. An investigation has been made of some of the physical properties of wrought gold alloy wires used in orthodontic procedure. The microstructure of these wires has also been observed.

2. A precise method to measure the flexibility of auxiliary springs has been described, using the cathetometer as the measuring instrument.

3. Results of measurements on different spring designs have been reported, using the following experimental conditions:

a. Simple cantilever spring with concentrated load.
b. Reflex spring with single concentrated load.
c. Reflex spring with uniform multiple loads.
d. Certain designs of practical appliances.

Experimental data and discussions have been presented for all the springs studied. A correlation of the data with spring design and with calculated values has also been given in several cases.

4. Data have been presented to demonstrate the flexibility of simple cantilever springs (1) when given varying heat treatments, and (2) when formed from different materials.

The authors wish to express their thanks to Dr. M. L. Ward for his real interest and the suggestions he has given during the progress of this work. They also wish to thank Dr. C. M. Waldo for his help in making some of the measurements.

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THE DEVELOPMENT OF THE JAWS*

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INDIVIDUAL development is a very complicated process, and the more it is studied the more evident does the complexity of the mechanism of the phenomena of life become. From the smallest unit, the cell, through its division, redivision, multiplication and differentiation evolves an organism similar in form to that of its specie and capable of performing the acts of life characteristic of that specie. We cannot help but realize that there is an unseen guiding influence of a supreme being directing this plan of life.

"The early history of the cell theory was obstructed in its development by the remains of the old Greek idea that living things could originate from non-living matter, that the swamp breeds disease, and the decomposing bodies of an animal, maggots. It required fifty years of work on the cell theory for Virchow, in 1850, to propound his thesis that all living cells are derived from a preexisting cell, and so establish the continuity of life, which has flowed on from the beginning in an uninterrupted stream, each individual being only a period."[1]

There is a plan of organization common to every cell, and all cells have common structural characteristics even though there are many variations in form and detail. In the internal organization of the cell the nucleus is perhaps the most important element, for the nuclear material directs and controls the activity of the cytoplasm. Without the nucleus a cell would not grow or produce another cell and no constructive metabolism would take place. However, destructive metabolism characteristic of the phenomena of life would continue until the cytoplasm would be destroyed.

There are two forms of cell division, direct and indirect or karyokinetic. The direct is comparatively rare. In indirect cell division the chromatic material of the nucleus is equally divided into a number of pieces. These pieces are in turn divided and half of each piece goes to make up the chromatin network of the new cell. "The constructive metabolism of the cytoplasm is dependent upon the presence of the chromatin in the nucleus."[1] Therefore, the process of metabolism depends upon interaction between the chemical substances of the chromatin, cytoplasm and food material.

Fertilization consists in the union of the chromatin material of two cells. In order that the resultant cell after fertilization may have the correct amount of chromatin material both cells must lose one-half of their chromatin material. The ovum divides and forms one polar body. Then the ovum and polar body both divide and as a result there are four cells of which only one is functional. The other three disappear. The spermatozoön is formed in the same manner and enters the cytoplasm of the ovum where it develops into a typical nucleus. This makes the ovum contain two nuclei, and each nucleus forms one-half the chromo-

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somes typical of the species. These are arranged between the centrosomes, a longitudinal division takes place, one going to each centrosome, a new nucleus is formed, and the cytoplasm divides into two cells. Due to the fact that these two cells contain nuclear material derived equally from the two parents the future development of the individual will be governed entirely by it.

After fertilization of the ovum, the process of multiplication begins, followed soon by differentiation both structural and functional. Functional differentiation becomes more and more evident as development progresses. Certain areas grow much more rapidly than others, and as a result of this law of unequal growth, invaginations as well as projections and outpocketings occur.

The process of multiplication by division of cells is called segmentation or cleavage, and the cells formed during cleavage are called the blastomeres. As rearrangement and differentiation take place, the cells form a mass similar to a mulberry, called the morula. The blastomeres then draw apart to form a central cavity and arrange themselves at the periphery to form a one-layered hollow sphere, the blastula. In the next or gastrula stage the upper cells which form the animal pole of the blastula multiply much more rapidly than the lower cells or vegetative pole, and this overgrowth produces an invagination of the blastula. The outer wall of this double walled cup is the ectoderm and the inner wall which lines the cavity, the entoderm. "Here we find the first great division of labor—the ectoderm to cover the body and to receive impulses from the outside and the entoderm to take in and digest food."[1] The gastrocele, the cavity formed by the invagination of the blastula, communicates with the outside world by means of a wide opening called the blastopore. Beginning at the head and proceeding backward this cavity becomes constantly smaller and forms the midline of the body. The primitive streak is formed by early thickening of the ectoderm in this region.

The primitive streak is an important center of activity and growth. Between the ectoderm and the entoderm and from the sides of the primitive streak a lateral proliferation of cells form a middle germ layer, the mesoderm. Beneath the neural plate, which is a thickening of the ectoderm at the anterior end of the primitive streak, is another area of rapid cell proliferation, the purpose of which is to form the notochord, the primitive vertebral column.

The lateral outgrowths of mesodermal cells from the primitive streak is called mesothelium because it is epithelial in character. Cells migrate from the mesothelium lying posteriorly to form the mesoderm of the head. These cells are nonepithelial cells of mesodermal origin and form the mesenchyme. The mesenchyme plays an important part in the development of the skeleton as well as connective tissue, involuntary muscle and blood tissue.

During gastrulation the gastrocele or archenteron becomes a tube and is the primitive digestive tract. Folds are formed in the development of this tube due to areas of rapid growth. The fold included in the head is called the foregut and gives rise to the epithelial lining of part of the mouth and oral plate, of the pharynx, esophagus, and stomach. It also gives rise to the epithelium of the tongue, pharyngeal pouches, respiratory tract, liver and the pancreas.

During the third week the foregut flattens and extends laterally to form the pharyngeal cavity soon to be characterized by five paired lateral outgrowths

called visceral or gill pouches. These are all significant except the rudimentary fifth because they have a part in the formation of the face and jaws and give rise to important derivatives. These grooves develop and break through, forming communications with the pharyngeal cavity and the outside. This process results in the formation of the visceral or branchial arches. The first arch is the mandibular the second, the hyoid, and the third, the thyrohyoid.

A depression in the ectoderm, the stomodeum, opposite the blind end of the embryonic gut develops to meet an entodermal outgrowth, and during the third week they meet and the oral plate ruptures causing a communication between the foregut and the stomodeum or primitive oral cavity.

The face is developed from the frontal process and the mandibular arch. By the end of the third week the anterior part of the forebrain bulges forward and ventrally, in front of the frontonasal process. The mandibular arch at this time grows ventrally and sends out a maxillary bud to grow forward along the base of the forebrain to form part of the maxilla. The anlage of the lower part of the face appears first in the form of the mandibular arches. They are at first separated by a notch but will later fuse in the midline. With the differentiation of the olfactory sense organs the development of the upper part of the face continues.

The median nasal process grows more rapidly than do the lateral processes and sends out two globular processes to unite with the maxillary bud to form the maxilla. If these buds fail to unite, the deformity of harelip results. The philtrum in the center of the upper lip is the result of fusion of the two globular processes.

When this fusion of the maxillary and globular buds is complete, the mouth and the nose cavity are enclosed together leaving a slit between the maxillary and mandibular arches which will form the mouth. This occurs during the fourth week, but the nasal cavity and mouth are not separated until some time during the third month. This is accomplished by horizontal ingrowths from the three parts making up the maxilla and beginning at the center and progressing backward. The premaxillary region gives off a small triangular piece which grows inward, and the horizontal and palatal processes of the maxillary buds on each side extend until they reach the apex of the triangle. While this is taking place the tongue descends to a lower position.

If this union does not take place, the deformity of cleft palate occurs, and due to the fact that fusion of the palate and fusion of the lip occur at different times, it is possible to have either cleft palate or harelip separately or they may be found together.

In the development of the face the mandible varies in its relation to the maxilla. At eight weeks the profile shows a marked recession of the jaw, a pug nose and a very prominent forehead. Then at about nine to ten weeks, probably due to a more advanced development of the mandible, the profile presents a prominent forehead and a mandible which is decidedly prognathic. At the fourth month the development of the mandible seems to have been retarded and is again micrognathic. After the fifth month the mandible and lip grow faster than the maxilla and its lip, until at birth a normal mesiodistal relationship be-

tween the maxilla and mandible is attained. "If, however, there is an arrest in the normal course of the development, the fetal condition may persist in the adult as a permanent micrognathia."[1]

About the sixth week of development both maxilla and mandible are completed. The area in which teeth will appear in both the mandibular and maxillary arches shows a multiplication of cells. This curved line which becomes a ridge is known as the dental ridge. Lingually and at right angles to the ridge is a continuous shelf, the dental lamina, which is a lateral outgrowth of the malpighian layer.

Parallel and labial to the dental ridge is another thickening of the epithelium, the lip furrow band which upon further deepening forms the vestibule of the mouth. The tissue labial to this band forms the tissue of the cheeks and lips, while the tissue lying lingually differentiates into the alveolar ridge.

The anlage of the frenum labii superioris arises at a point in the midline of the lip furrow band. "This frenum is a fold of tissue which in the embryo joins the upper lip with the palatal papilla and acts as a bridge separating the left and right vestibule. According to Schumacher, a broad frenum labii superioris indicates an incomplete or delayed fusion of the paired anlage of the vestibule rather than a hypertrophic condition. The frenum labii inferioris develops in a similar manner in the mandible."[1]

From the surface of the dental lamina ten epidermal buds which will soon form the enamel organs of the deciduous teeth are given off. The tooth germs of all the deciduous teeth are completely enclosed in their follicles, and the enamel organs for the permanent teeth which succeed them have begun to develop by the sixteenth week.

About the seventeenth week a bud starts to grow down into the mesoderm from a point on the dental lamina just posterior to the deciduous tooth germs. This is the enamel organ for the first permanent molar. At birth the follicle is complete and calcification has begun.

The first permanent molar differs from the other permanent teeth in regard to origin and development. It is the only permanent tooth which is given off directly from the dental lamina in the same manner as are the deciduous teeth. It also is the only permanent tooth the crown of which is calcified by the time the individual must depend upon its own resources for nourishment.

A bud is given off from the outer tunic of the first permanent molar enamel organ to form the second permanent molar, and the third permanent molar is formed in the same manner from a bud given off from the outer tunic of the second permanent molar.

After the closing of the follicle wall the epithelial cord ceases to be continuous and breaks up into irregular masses of epithelial cells lying in fibrous tissue. Sometimes one of these masses of epithelial cells becomes globular in form and may form an enamel organ which accounts for the occasional supernumerary deciduous tooth.

The buds for the successors of the deciduous teeth grow apically and to the lingual of the follicles of the deciduous teeth, and the same process occurs with the permanent teeth as occurred with the deciduous. Therefore, a supernum-

erary of the permanent teeth may form the same as may have happened in the deciduous teeth. When this happens the supernumerary lies between the deciduous and the permanent teeth and as a rule would erupt before the corresponding permanent tooth.

At birth all of the deciduous teeth and all of the permanent teeth excepting the second and third molars are present in the jaws in relative formation. The teeth as they grow and develop exert a very important influence in the development of the jaws and face from birth to adulthood. The teeth are first formed, and then the bone is laid down around them giving them the required support. The connective tissues are specialized to meet mechanical conditions and are then formed as a result of applied mechanical stimuli. This adaptation to mechanical environment is due to a continual building and tearing down of bone to alter its form according to the requirements of support.

"The rôle of strain on the preservation and thickening of the bone framework is incontestable. This generally arises from the load carried by bone, an organ of support; the skeleton is preserved through the exercise of this function."[2]

The interplay of the modeling action of fibrous tissues and musculature on the form of bones offers a restraining influence on the growth of bone by causing pressure which leads to resorption, limitation and orientation. These actions are responsible for the modeling of bone into definite form and architecture. Thus we have not only growth of bone as a result of the mechanical stimulation of function but also a limiting of the amount and direction of bone growth, by function.

Earlier in this paper the point has been brought out that the original cell is composed of equal amounts of chromosome material from each parent and that the future development of the individual is controlled by this material. This being the case we must admit that heredity will play a great part in the development of the individual. The pattern or general form of the bone is fixed by heredity, but the processes, ridges and details are acquired under the influence of functional excitation, forces which serve only to modify a comprehensive form as laid down by the development of the embryonic outline. These facts have been born out in works done by Braus, Weidenreich and W. Müller.

It has been noted that at birth the mandible is straight, and as the teeth erupt the body of the mandible increases in size and the ramus develops. As a result of this growth the angle of the jaw gradually assumes a more acute angle.

Dr. Korkhaus, after an examination of newly born infants, makes the claim that at birth the mandible is in distal relation to the maxilla and that it does not assume its normal mesiodistal relation until the third or fourth month. In some instances the forward growth of the mandible is so rapid as to form a prognathic condition. However, the environmental elements and hereditary influences must be considered and a further investigation in that direction must be followed.

At birth the tooth germs of the maxilla lie just beneath the floor of the nose and orbit. The maxillary sinus is absent at birth, or at least there is very little indication of its presence. There is a vast difference in a comparison of the dis-

tance between the floor of the orbit and the top of the skull and the distance between the alveolar process and palate.

To balance the skull properly in the relation of the cranium and face, a downward, outward and forward growth of the lower part of the face is necessary. Along with this growth there is also a downward, outward and forward growth of the maxilla and an upward, forward and outward growth of the mandible.

A great deal of growth also takes place in the alveolar process. Brash[3] makes this conclusion as a result of his madder-feeding experiments:

"The general conclusion is that the alveolar arches are in a constant state of change. Not only is there constant upward growth, the actual plane of the alveolar border carrying the teeth with it being constantly renewed, but there is also a continuous movement of all the teeth in two other directions—buccal and proximal. The actual position of the teeth in the arch at any given time is the resultant of these three movements, the forward diminishing slightly the increase in width of the dental arch due to the upward and outward movements. Differential rates of movement in these three directions will bring about the changes to be observed in the normal development of the alveolar arches, and a disturbance of these movements, however caused, will readily account for anomalies in the shape of the arches and in the position of the teeth."

The growth of the jaws and face after birth is influenced to a great extent by environmental factors either helpful or harmful and by normal function, abnormal function or lack of function. Mechanical stimulation, as a result of these factors, then produces either a normal denture with normally developed jaws or a malocclusion with its characteristic accompanying deformity.

Normal growth and development is interfered with in many cases to the extent that malocclusions and facial deformities are developed in a large percentage of children. But the fact still remains that bone is a plastic material and will respond to mechanical stimulus, either natural or synthetic, and by applying this stimulus by means of appliances and by restoring function the deformity may be corrected. Assuming that all etiologic factors of the arrest in development have been eliminated and the malocclusion and deformity corrected, thus bringing the development of the lower third of the face to the point we consider as normal for the age of that particular individual, it is logical to assume that normal growth and development will continue to build ultimately the normal face and jaws of the individual.

This fact justifies the early treatment of malocclusion in the deciduous denture and makes possible a more nearly perfect resultant development and occlusion than is possible to obtain by orthodontic treatment after the deformity has progressed to a more advanced state. However, the treatment of the deciduous denture requires vision and presupposes a definite knowledge of the growth and development of the individual from the smallest unit of life, the cell, through the different periods of growth and development, to the completed denture of the adult.

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A REVIEW OF THE EVOLUTION OF THE LABIAL EXPANSION ARCH*

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IT HAS appeared to me that a review of the evolution of the labial expansion arch would be of interest, because:

First, in all probability it is the most important basic part of any orthodontic appliance regardless of type or system.

Second, a review of its development will assist in a fuller appreciation of its possibilities and worth.

Third, being conversant with its history, the operator may avoid many mistakes committed in its use in the past.

Fourth, its evolution was slow and tedious, nevertheless, romantic because of its contributors.

It is difficult to ascertain the exact date of the first use of the expansion arch in the treatment of malocclusion, because earlier than the eighteenth century the literature on dentistry, especially orthodontia, is meager and scattered.

In 1723 Fauchard gave us the first authentic record of its construction and application, although its conception and use by others undoubtedly antedated his description of it. Describing it, he said, "If the teeth are much out of line and cannot be corrected by means of threads (gold), it is necessary to use a band of silver and gold. The width of the band should be less than the height of the teeth to which it is applied. The band must be neither too stiff nor too flexible. Two holes are made at each end, a thread, which passing partially through forms a loop in the middle of each thread. If the tooth is inclined outward, the band is applied exteriorly; if it is bent inward, it is applied inside the teeth. The nearest of the upright teeth to those that are bent are then encircled with the ends of the threads, which, passed from the exterior to the interior of the arch, or from interior to the exterior, as the case might be, finally having crossed a number of times, are tied and their ends cut off. When one end is fastened the other is treated in a like manner." Fauchard's appliance was chiefly an expansion arch and possessed many principles that are retained in the modern expansion arch. Its form assumed that of an ideal arch, and it afforded a base from which force was delivered against the tooth or teeth to be moved.

Following Fauchard's use of the arch it was refined, and various attachments were added to make its application more definite, but the principles remained unchanged.

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Although Mouton, in 1746, described the use of gold crowns on both anterior and posterior teeth in conjunction with an arch similar to that used by Fauchard, the next important contribution may be credited to Bernard Bourdet, who used the principles of Fouchard's appliance but extended its use considerably. In 1757, Bourdet described the appliance he used in the treatment of malocclusions. It consisted of strips of gold plate semicircular in shape placed on the outside of the maxillary arch and the inside of the mandibular arch extending from second molar to second molar. Each strip was pierced by twenty holes, and the teeth were attached to the arch by means of threads passed through the holes opposite each tooth and then around it. These threads were removed and tightened twice each week, thus bringing the malposed teeth into alignment. He advised against the use of silver because it discolored in the mouth. After Bourdet, almost fifty years elapsed before any decided improvement was made in the use of the expansion arch.

Joseph Fox, in 1803, dealing with linguoversion of the maxillary incisors said, "To remove this kind of irregularity, two objects must be accomplished: one, to apply a force which shall act constantly upon the irregular tooth, and bring it forward; the other, to remove the obstruction which the under teeth, by coming before the upper, always occasioned." To effect these two objects in the treatment of the above type of malocclusion, Fox used an arch made of gold or silver, about a sixteenth of an inch in thickness and of proportionate width, that extended to the deciduous molars on either side. Blocks of ivory were attached to this arch, one on either side in the region of the molars, thick enough to keep the jaws from closing completely. The arch was perforated by holes to permit ligating to the buccal teeth for anchorage and also to the anterior teeth that were to be moved. Here is found the first conscious thought of removing interference in the movement of teeth.

The year 1815 marked a new day in the development of the expansion arch. Until this time rotations of the teeth were effected by the use of silk ligatures, notched hickory or the pelican forceps. In that year Christopher F. Delabarre described for the first time the use of the spring or principle of the lever in conjunction with his metallic box or crown for the rotation of teeth. The appliance consisted of a crown which was accurately contoured to the coronal portion of the rotated tooth and had a short threaded tube soldered to it endwise. A piece of gold wire, one end of which was threaded and bent at right angle and the other end with a loop contoured in it, was screwed into the tube on the crown. The looped end was sprung against and ligated to the teeth, thus rotating the malposed tooth.

Delabarre also devised a wire crib which he used in place of the ivory block advocated by Fox to keep the jaws open. Later the crib was modified by others and used as a means of anchorage.

In 1829 a new method of removing the interference occasioned by the opposing teeth was suggested, namely, the use of gold caps or crowns carefully adapted to the teeth. In this year Thomas Bell described the use of gold crowns on the molar teeth instead of the ivory blocks used by Fox, because the crowns were less bulky and afforded a masticating surface. He also suggested the use of

a stamped bar or arch which was closely adapted to the labial and buccal surfaces of the teeth in place of the straight bar used by Fox.

Imbrie, in 1834, using Bell's method of employing crowns, went a step farther and suggested that the arch be soldered to the crowns as a means of anchorage. This was an important contribution to the development of the labial arch and was used by many in the years following.

Chapin Harris, a teacher, organizer and prolific writer on dentistry, in 1839, using Fox's principles in the construction of the labial arch, soldered its ends to gold crowns placed on the molar teeth. Although the method of soldering the arch ends to molar crowns was previously advocated by Imbrie and Desirabode, Harris through his capacity as teacher and writer so carefully described its application in the treatment of malocclusion of the teeth that its use increased for many years; therefore, in a sense he contributed to its evolution.

That the development of the labial expansion arch was to a great extent dependent upon the collateral development of anchorage cannot be overlooked and must be considered in the review of the former mechanism. If anchorage is unstable, the arch must necessarily be inefficient; this fact is readily acknowledged in the use of our modern appliance.

During the hundred years previous to 1840 the labial arch was large and bulky. An arch of such size was necessary, for, with the exception of the attempts made by Imbrie and Harris to gain increased anchorage by the use of gold crowns on the posterior teeth, ligatures were chiefly relied upon for the attachment of the arch to the teeth.

The invention of the dry method of vulcanizing rubber in 1840, although not directly concerned with the evolution of the arch, was a stimulating factor because it afforded new means of obtaining anchorage.

Schange, in 1842, made a definite contribution to the development of the arch through improved means of anchorage. He described an improved crib which was not so bulky as that previously suggested by Delabarre, nor did it prevent the jaws from completely closing but merely provided anchorage. He devised the first clamp band, which he used on the anterior teeth to effect rotation by means of ligatures. It is interesting to note that the labial bar or arch used by Schange was reduced in diameter. Undoubtedly this was possible because he used the crib for anchorage.

One of the earliest arch auxiliary parts to be introduced was the spiral spring. J. D. White, in 1850, described the use of this type of spring for the expansion of the dental arches and also for the rotation of individual teeth. To produce expansion the spiral spring was placed inside the dental arch with its ends attached to bands or cribs on the premolars or molars. In 1854 he described its use in conjunction with a labial arch, for the contraction and alignment of the dental arches. These latter movements of the dental arch were obtained by using a narrow flat labial arch which did not quite extend to the molar cribs. One end of the spiral spring was attached to the end of the labial arch and the other to the molar crib. The contractile power of the spring enabled the operator to move the posterior teeth mesially or the anterior teeth distally.

Although T. W. Evans did not introduce any new principles in the use of the labial arch, he did describe some new methods of application, many of which are still in use today. Using a crib form of anchorage he soldered double loops or plain tubes to the buccal surface of the cribs, and also increased the stability of his crib attachments by soldering them to a metal palatal piece. He used a labial arch made of hard drawn gold a sixteenth of an inch square. He also improved on the use of spiral spring by passing his arch through the spring and then through the double loops of wire soldered to his molar cribs, thus obtaining much more stability.

When using the buccal tube, Evans threaded the labial arch and then by placing a nut on the arch at either the mesial or distal end of the tube he was able to increase or decrease the length of the arch. Both of these methods in modified form are used today.

He stated four requisites of appliance construction that are as applicable today as they were in his day. They are: (1) a firm support which shall not loosen or in any way injure the teeth to which it is attached; (2) a steady and sufficient pressure, which can be graduated to suit particular cases and particular stages of an operation; (3) great delicacy of construction that the apparatus may be as light as possible, so as neither to injure nor annoy the patient; (4) finally, a mechanism as simple as the case will admit of in order to economize both labor and time.

The next quarter century did not bear many advances in the expansion arch. Vulcanite was used extensively because of its adaptability in palatal construction. Stable anchorage was more readily obtained in an appliance made of this material than in any other appliance used heretofore. Previously it was stated that the utilization of the labial arch was greatly dependent on the development of fixed anchorage. Its use and desirability increased as anchorage was obtained by means of ligatures, cribs, crowns and plain bands in their respective order, but as all of these methods depended upon friction for retention there still remained much to be desired. This final need was ultimately answered when Magill, in 1871, described the cementing of a plain band to the tooth. Thus in the cemented band was found the crying need of anchorage satisfied, and the arch in the next fifty years underwent a most astonishing evolution.

John N. Farrar, "father of modern orthodontia," a mechanical genius and prolific writer of orthodontic literature, although contributing much to the mechanics of the labial arch, probably contributed more to the physiologic considerations in the use of any appliance. He was the originator of the theory of intermittent force. He developed the use of the screw to the height of possibility by using it alone and in conjunction with a short labial arch. He also devised a form of clamp band which was used on molars for anchorage.

An interesting prediction made by Farrar, in 1878, that has been realized today, may be stated here. He said, "Although the simplification of regulation has been a great desideratum for many years, it has for some time been evident to me (though by most people thought to be impracticable) that the time will come when the regulating process and the necessary apparatus will be so systematized and simplified that the latter will actually be kept in stock, in parts

and wholes, at dental depots, in readiness for the profession at large, so that it may be ordered by catalogued numbers to suit the needs of any case. So that by a few moments' work at the blowpipe in the laboratory the dentist may be able, by uniting the parts, to produce any apparatus, of any size desired, at minimum cost of time and money."

Although Farrar was the first to recommend the "righting up" of crowns in the movement of teeth, Guning, following shortly after, suggested the bodily movement of teeth instead of tipping teeth.

The year 1882 brought forth the predecessor of the modern expansion arch. Here for the first time we see an arch with various auxiliary attachments such as that in use today. John Patrick described his appliance as comprised of "a half-round gold and platinum bar curved to correspond with the shape of the arch, having upon it a number of sliding rings, by means of which anchorage is secured and attachment made to the teeth to be moved. The bar is bent with its flat surface inward, and is of sufficient length to allow its ends to rest gently on the external lateral surfaces of the first molars as desired. The slides are fitted accurately so as to move steadily. Two of these which are made longer for the purpose are used to secure anchorage, by soldering to their inner surfaces thin gold bands, previously fitted to the teeth selected. The bar is held in position by set screws, passing through them. Small buttons are soldered to their external surfaces, through which the screws pass to give them greater purchase. To the smaller slides the different appliances for moving teeth are attached, as wedges, hooks, T-bars and bands of various sizes and shapes as required."

Its action was that of a bowspring, and in this principle it was the predecessor of the various modern expansion arches.

The year 1889 was significant in the history of orthodontic appliances, for in that year Farrar's prophecy of a stock appliance was realized, when Angle introduced his first set of standardized appliances. Although he had used the expansion arch along with plain cemented molar bands for some years previous to this time, it was in that year that he described his original system of appliances which consisted of labial expansion arch, jack screws and tubes or "pipes" of varying lengths.

The construction of his appliance was simple. Plain bands of gold, platinum or German silver were cemented to the molars and also to the anterior teeth when necessary. To the buccal surface of the bands he soldered pieces of tubing 5/8 in. in length. His labial arch was made of 19 gauge hard-drawn platinum-gold wire, formed to encircle the dental arch and made to approximate the shape of an ideal arch. Pieces of tubing soldered to the arch itself were also used, for the purpose of attaching ligatures. Although his appliance merely embodied the principles advocated by others of an earlier date, it is of importance because it heralded the beginning of a period of intense development of the expansion arch and also a time when the arch was generally accepted in preference to other methods of treatment.

The years following Angle's introduction of the first set of his appliances brought improvements and modifications by him and others with startling rapidity that increased the use of the labial arch manifold. A year later he de-

vised a ratchet spring lock on the arch by notching the arch and soldering a spring ratchet to the buccal tubes. This was used in conjunction with an occipital bandage and was intended to prevent the arch from traveling forward in the tubes when the bandage was removed.

In 1899, in the paper in which he introduced the friction sleeve nut used in buccal tubes, it is interesting to note his stated advantages of the expansion arch. He said, "The expansion arch possesses qualities which will probably always keep it easily in the lead of all other regulating appliances. By its use we have control over the entire dental arch; over the teeth individually, as well as collectively in contradistinction to the vast number of appliances which have been devised to act principally by reciprocal force upon the malposed teeth alone, and by which so acting usually effect displacement of others originally in correct position, so that these in turn require devices for their correction, etc.

"Again, with the arch we have the greatest control over anchorage, being able to employ, simple, reinforced, reciprocal, and even a certain amount of stationary anchorage, so that it is possible to concentrate upon one tooth the combined resistance of all the remaining teeth.

"Finally, it is an ideal pattern to guide in tooth movement, and to which the dental arch is molded to conform, besides being a temporary retainer as well."

In 1895, Angle introduced the use of annealed brass ligatures to the profession. Eight years later or in 1903, he described the Angle expansion arch which was a round wire labial arch with "a delicate rib on the periphery of the unthreaded portion." This rib was notched at desired points to prevent the slipping of wire ligatures. At this time he also advocated the use of intermaxillary elastic force in the treatment of malocclusion, described by Baker and Case simultaneously in 1893, the first using it in the treatment of distoclusion and the latter in the treatment of mesioclusion.

Although Farrar was the first to suggest the necessity of root movement. Case, in 1893, not only advocated it but demonstrated an appliance which he had used in obtaining it and also several finished cases wherein the principle was used. For some unknown reason this principle was overlooked by the profession until 1908, when Angle brought forth the question of bone growth. Believing that bone growth was indispensable to the successful treatment of malocclusion, and that it was not always possible to obtain it by the use of a round wire labial arch, he, in 1910, evolved the working retainer, which was the predecessor of his pin and tube appliance introduced by him in 1911.

Heretofore the expansion arch was used as a pattern, and the teeth were brought into contact with it by means of ligatures or other agents until the general shape of the dental arch conformed to the predetermined form of the expansion arch, but now a radical departure from this principle is noticed in that the expansion arch itself is distorted to conform to the irregularity of the teeth and then gradually recontoured, bringing the teeth with it, to the predetermined shape.

Angle's earlier expansion arches were constructed of German silver, but for obvious reasons in the manufacture of the pin and tube appliance precious metals were used exclusively. The appliance consisted of bands with vertical tubes

soldered to their buccal surface, cemented on all teeth to be moved. The anchor teeth retained the clamp band and friction sleeve power tubes used in the previous appliances. The arch was a sectional one consisting of three pieces. The middle section was made of 0.030 in. elastic wire to which were soldered vertical pins that engaged in the tubes on the bands. Later Young's development of this appliance resulted in the placing of vertical and horizontal loops in the labial arch between the pins in order to facilitate mesial and distal movement of teeth.

This appliance was the first of several which depended on the elasticity or spring of the expansion arch itself for the movement of teeth.

Robinson, finding the pin and tube appliance difficult to adjust properly, introduced, in 1914 his "looped arch and appliance for attachment," in which he embodied the principle of arch distortion employed by Angle but devised a new means of attaching the arch to the teeth. In his estimation the arch was more easily constructed and adjusted than the pin and tube appliance.

Describing his appliance, Robinson said, "The appliance consists of a delicate spring arch, bent to conform to the individual dental arch to which it is to be applied, with loops extending toward the root or toward the occlusal end as may be found convenient, placed in advantageous position; and an attachment consisting of a seat soldered to a plain band on the tooth and a square hollow block of metal, the outside measurement of which is the same as the inside of the seat, and the bore of which is equal to the diameter of the arch wire.

"The seat has a flat base and parallel walls extending at right angles to the base, the walls being 50 per cent higher than the width of the base, which allows sufficient material to bend over the fourth side of the block, thus enclosing it in a square tube which it accurately fits."

First, bands with seats were made and cemented to the teeth. Then, the required number of blocks were slipped onto the arch, and starting with the molar on one side they were soldered to the arch in their proper position, with loops in the arch wire intervening wherever thought necessary. Finally the arch was attached to the teeth by inserting each block in its respective seat, and the flanges of the seat were bent over the block.

The next year he modified the seat and blocks by rounding their labial surface and left the seats open but used a pin or spike to lock the block in the seat.

In the development of his appliance Robinson arrived at deductions which were later embodied in appliances introduced by others. He said "It is obvious that a triangular block, or any angular or oval or round block, with a pin raised on one side placed in appropriate shaped seats, would accomplish the same results."

Again, "During the development of the appliance, the writer first used a square wire for the arch; he then tried a triangular wire and afterwards a flat wire, with appropriately shaped seats and locking device for each form of wire. These forms proved equally efficient, but all had the common fault of producing a completed arch of unequal expansive force when loops were put into the wire, owing to the sharp angles produced when the arch was bent. This was due to the fact that equal resistance is not obtained when, for instance, a flat wire is bent in the direction of one of its flat sides one time and in the direction of the edge

the next time. Still greater uncertainty is encountered in bending a square wire in any angle between the flat side and the corner. In using these angular wire arches it was not necessary to solder blocks to the arches, as the arch wire could at any place be locked securely into the seat. The advantage of being able to put in loops at any angle, without producing unequal elasticity so far outweighs the small disadvantage of soldering the block onto the round wire that there is now no question in the writer's mind as to the superior merits of the round wire for the arches."

Realizing the difficulties which attended the construction and manipulation of the pin and tube appliance, Angle in 1916 presented the ribbon arch mechanism. In it he retained the principles of tooth movement that he had earlier embodied in the pin and tube appliance. He called it the ribbon expansion arch, because it is flat and nonsectional with parallel sides and round edges. The ends of the arch are threaded, and it is attached to the teeth by means of brackets soldered to the labial surface of the bands cemented to the teeth. Angle describing the bracket said, "The outer edge of the bracket is rounded, as are also its corners and its two ends, its sides being straight and parallel. Inwardly, a deep transverse slot extends downward in the bracket one-half the length of the bracket, terminating in a concave floor. The walls of this seat are parallel, one of them being formed by the band material and the other by the inside of the bracket proper. In the center of the latter wall is a delicate square perpendicular groove which passes downward and through the floor of the bracket." The arch is fitted into the bracket from the occlusal and is locked in place by a pin or spike passed through the perpendicular groove and bent over the side of the bracket nearest the gingival. Along with this mechanism he also introduced the curvilinear buccal sheath or tube for which he claimed advantages over the former type of buccal power tube as follows: First, because the distal end of the sheath lies closer to the tooth, it is less annoying to the buccal tissues; second, if the arch end is curved slightly more than the sheath, friction is gained and the arch cannot work forward; third, more stability of the anchor teeth and also more definite force when a movement of them is desired; fourth, a longer arch can be used.

In the same communication in which he first described the ribbon arch mechanism, Angle also criticized the perpendicular loop in the labial arch used by some operators, in preference to the screw as a means of applying force from a base of anchorage. He said, "My criticism is that instead of the force being delivered evenly to the anchor tooth and in one direction only, as is easily possible with the screw, the direction of force is constantly changed, thus mischievously disturbing the function of the cells of the peridental membrane and alveolar process."

In 1917, Lourie, in a consideration of Angle's above criticism of the looped labial arch said, "Later he limits this criticism to vertical loops in the buccal portions of the arch, attempting to whitewash the same objections in horizontal loops in other portions of the arch, which are so extensively used in his 'pin and tube' and 'ribbon and arch' appliance. However, I submit for your consideration the suggestion that spring loop reaction is much the same whether in the

vertical or in the horizontal plane. Also that the various arch bends and twists by which force is applied in the above mentioned appliances or any other of the same principles of force of delivery, are but modified forms of spring loops and subject to the same criticism."

Contained in the same paper with the above statement was Lourie's description of his appliance, "The concealed labial arch wire with spring extensions." This appliance consisted of "a comparatively rigid base wire preferably adjustably attached to the anchor teeth," lying above the gingival marginal of the teeth but not in contact with the soft tissues. Small spring extensions were soldered to the base wire, the purpose of which was to deliver force for individual tooth movement. The springs were adjusted to push or pull and were attached to the teeth by means of points, hooks, ligatures and bands. The advantages he stated for the appliance were its inconspicuousness, cleanliness and individual tooth movement.

McCoy, in 1924, using a principle of attachment that had previously been employed by Case introduced his "open tube appliance." The significant factor of importance in this appliance was the use of an incomplete tube soldered horizontally to the band which was placed on the tooth to be moved. The tube had a bore of 0.030 in. and had not less than 25 per cent of its circumference cut away. The tube was soldered to the band at its central point of external circumference, thus making it possible to place the labial arch a 0.030 or 0.036 in. round wire, but preferably the former, in from the labial and buccal. Two arms of unequal length extended laterally from the tube, one of which was soldered to the band to provide reinforcement and the other a hook or spur for the attachment of a ligature from the arch to effect rotation. Vertical arms or extensions were soldered to the labial arch to effect tipping or bodily movement of the teeth.

In a day when proper orthodontic treatment often necessitated the bodily movement of teeth and only rigidly attached appliances were available, the open tube appliance readily found a niche in the armamentarium of the orthodontist because of its semirigid manner of attachment.

Although Angle believed that "All the various necessary tooth movements in the treatment of any case are not only possible but very practically possible in the use of the ribbon arch mechanism," he nevertheless, in 1925, described his latest appliance which he named the "new mechanism or edgewise arch." This he explained as follows: "Because of greater efficiency of the new mechanism, due to the more free and direct expenditure of force and, especially, to the more perfect control of force it affords and its consequent greater conformability to the physiologic requirements of the tissues involved in tooth movement."

This appliance, as does the ribbon arch, makes use of a bracket band on the teeth to be moved. The slot in the bracket is cut horizontally across it midway of its length. The arch is secured in the bracket by means of ligatures. The suggestion is made that treatment may be started with a light resilient round wire arch of a size that will fit into the brackets. Later a rectangular arch used edgewise is employed to finish the treatment.

The principles of this new mechanism are somewhat similar to those of the ribbon arch. Both depend on the distortion of the labial arch but, whereas, in

the ribbon arch treatment is begun with a distorted arch rendered passive that is gradually reshaped at intervals until it approximates the form of the predetermined arch, in the new mechanism it is immediately formed to the shape of the predetermined arch and then sprung into and attached to the brackets thus having a more or less automatic action and a continuous instead of an intermittent force of tooth movement.

I acknowledge that the afore planned review has rapidly become a mere recapitulation, but even in a résumé such as this there is much of interest because history is a teacher in the present and a guide to our future.

In concluding, the following deductions may be considered: First, that the labial expansion arch, in its various forms, has remained the most useful and flexible appliance, regardless of the many innovations in appliances in the past; second, that the greatest contributions to the development of the labial arch or any appliance were not of necessity made by the searchers and discoverers of new principles, but rather by the men who organized and united the existent strands of knowledge in a usable and practical whole; and third, that notwithstanding the fact an art or science must have visionaries if it continues to develop, it behooves most of us to become proficient in the use of some of the existing types of appliance, instead of constantly searching for newer forms.

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RECESSED ANCHOR LUGS FOR USE WITH THE LINGUAL AND LABIAL ARCHES, ALSO PROGRESS REPORTS OF CASES WHERE ONE PIECE LINGUAL ARCH WAS USED*

WALTER H. ELLIS, BUFFALO, N. Y.

THE new recessed anchor lugs for use primarily with the one piece lingual arch, and secondarily to stabilize the 0.038-0.040 labial arch, are here presented.

As the complete technic for the construction and use of the one piece lingual arch was reported in the INTERNATIONAL JOURNAL OF ORTHODONTIA, ORAL SURGERY, AND RADIOGRAPHY, August, 1931, and the tube soldering technic in January, 1930, they will not be repeated here.

The anchor lug which I have designed since that time is shown in Fig. 1.

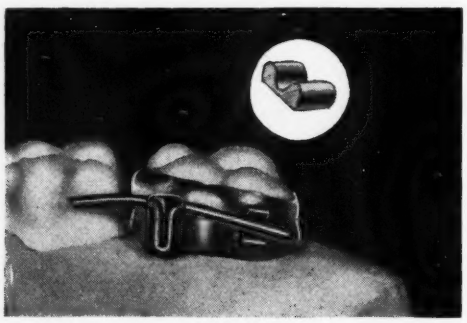

Fig. 1.

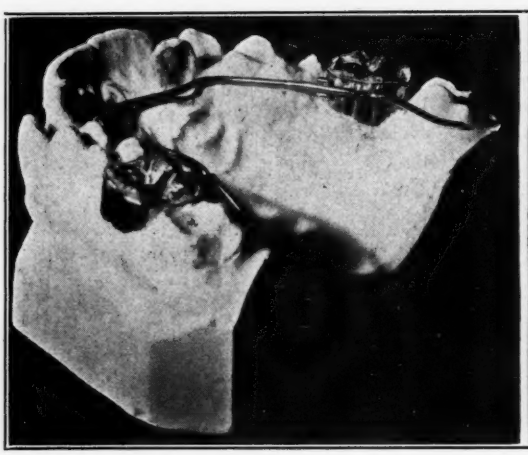

Fig. 2.

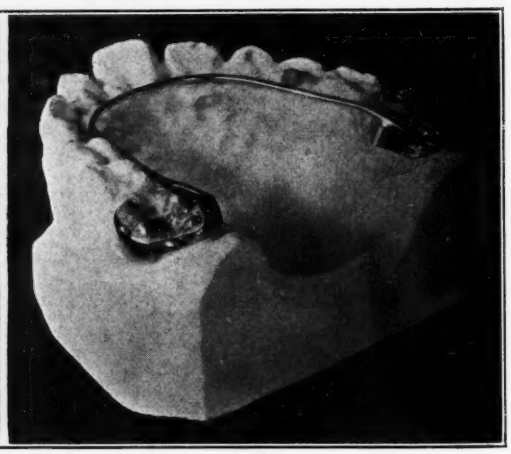

Fig. 3.

This anchor lug gives more positive fixation than do those originally shown, particularly as related to possible vertical mobility of the arch.

In the arch technic the distal extension of the arch is bent accurately into the recess of the lock. The bending of the arch end extension controls the ver-

*Clinic presented before American Society of Orthodontists, Toronto, May, 1933.

tical position of the anterior portion of the arch. A bend occlusally of the arch end extension will, when the arch is seated and locked in the lug recess, cause the anterior section of the arch to fit against the incisors more snugly; while a

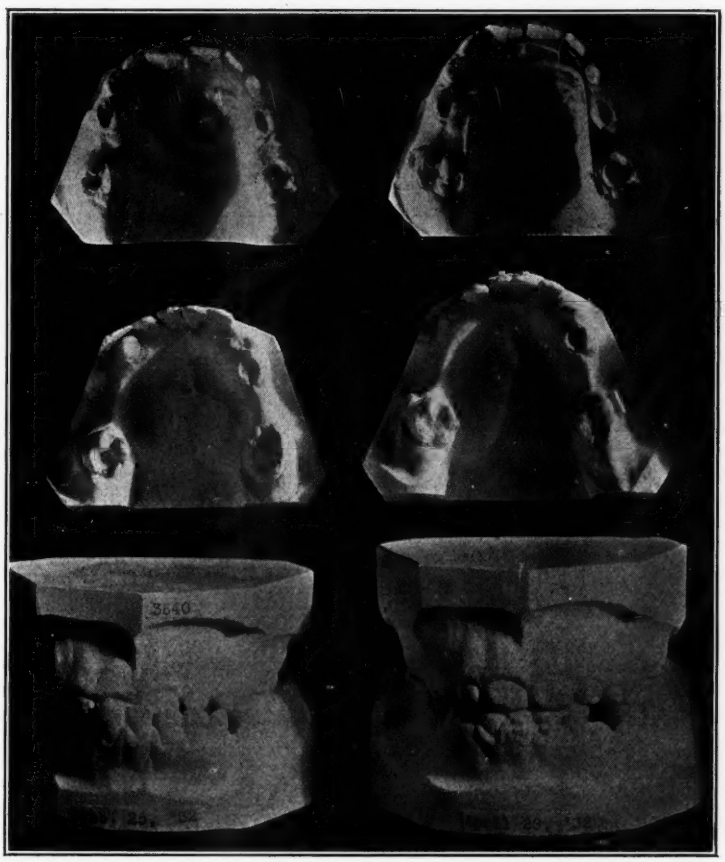

Fig. 4.

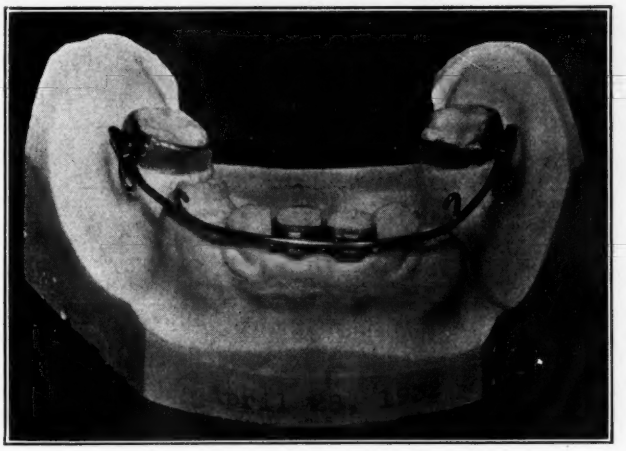

Fig. 5.

bend of the end extension toward the gingiva will tip the anterior portion of the arch away from the incisors when the arch is seated. Therefore it will be observed that accurate seating of the anchor post loop into the tubes and of the distal end section of the arch into the anchor lug recess is indicated when as-

sembling the appliance and during treatment. Also it is important that the end section be bent or locked with tension into the lug recess to establish, by reaction within the tube, torque locking, which is an important feature of this arch lock.

In cases where possible displacement or breakage of the arch is anticipated because of lack of the patient's cooperation, the recessed anchor lug can be located anterior to the oval lingual tube (Fig. 2).

In this adaptation the tube is placed at the distolingual angle of the molar band, and the anchor lug at the mesiolingual angle at least 5 mm., or more if

Fig. 6.

possible, anterior to the tube. When the arch is being fitted in position it is carefully bent so that it will spring accurately into the lug recesses. The 0.038 arch can be so applied, although an arch of 0.040 wire will adapt itself more readily to this type of assembly. The distal arch extension may be bent against the second molar, if the second molar is present, otherwise it is shortened and curved gingivally against the molar band.

It is suggested that this anchor lug can also be used to lock the lingual arch of the soldered half-round anchor post type (Fig. 3).

This use insures a positive locking that can be increased at will by bending the distal arch extension into the lug recess with any degree of pressure, thus increasing the friction within the tube. Furthermore this assembly by eliminat-

ing the conventional soldered locking spring, does away with two soldering operations on the arch near the points of greatest stress, with possibility of consequent embrittling and weakening of the arch. This use of the anchor lug, in my opinion, is an efficient, self-cleansing type of lock.

The following case reports show progress from treatment by means of the one piece lingual arch.

CASE 1.—Fig. 4 shows a case in which a labial arch was used on the mandibular arch with recessed anchor lugs soldered to incisor bands for stabilization of the arch. The second model shows the lug recesses in which the arch rests. This use of the anchor lugs on two or all of the incisors allows use of the usual 0.038 or 0.040 arch and insures the indicated stability of mandibular arch anchorage in Class III cases. Also may be used to stabilize the maxillary arch in Class II cases.

One piece lingual arch used on maxillary arch. Appliance placed Feb. 25, 1932. Second model April 28, 1932, shows progress made in two months' treatment. Case not yet completed.

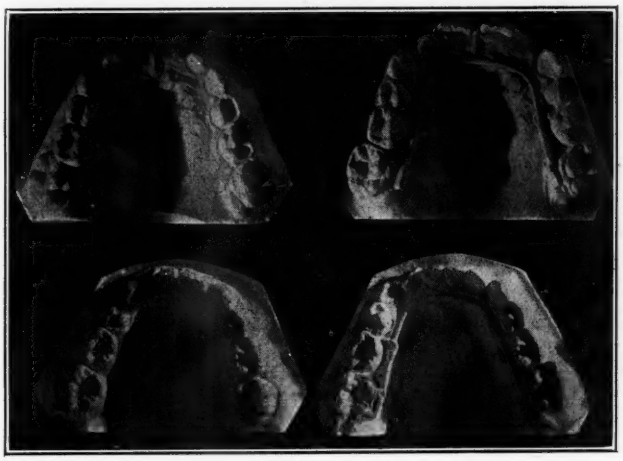

Fig. 7.

Fig. 5 shows the labial arch and recessed anchor lugs for stabilization assembled on the model as used in this case.

CASE 2.—Fig. 6 shows a case in which a one piece lingual arch is used in connection with maxillary labial arch and intermaxillary ligatures.

First model May 28, 1931. Second model April 28, 1932. Lingual arches have auxiliary spring attachments for expansion and incisor alignment. Case not yet completed.

CASE 3.—Figs. 7 and 8 show a case in which unilateral contraction in maxillary right molar region and unilateral expansion in mandibular right molar region were indicated.

First models October 28, 1931. Second models April 26, 1932, show tooth movement accomplished to date with appliances in place; the one piece lingual arch so modified as to accomplish the indicated tooth movement; vertical anchor loop post for stationary anchorage used on one side, horizontal round tube and arch end used on other side for molar tipping; indicated auxiliary springs used for lateral expansion. Case not yet completed.

CASE 4.—In Fig. 9 the first model shows case at commencement of treatment, Sept. 17, 1931.

Second model, Dec. 31, 1931, with arch used in place on the model, shows how auxiliary springs had moved teeth away from the arch which had rested against the incisors at commencement. On this date the arch was replaced by a new one of larger size to rest against the teeth in their new positions. An impression was then taken with the new arch in place, as shown in model three. Arch change made in the mouth in five minutes' time. Treatment was continued beyond this point. Case not yet completed.

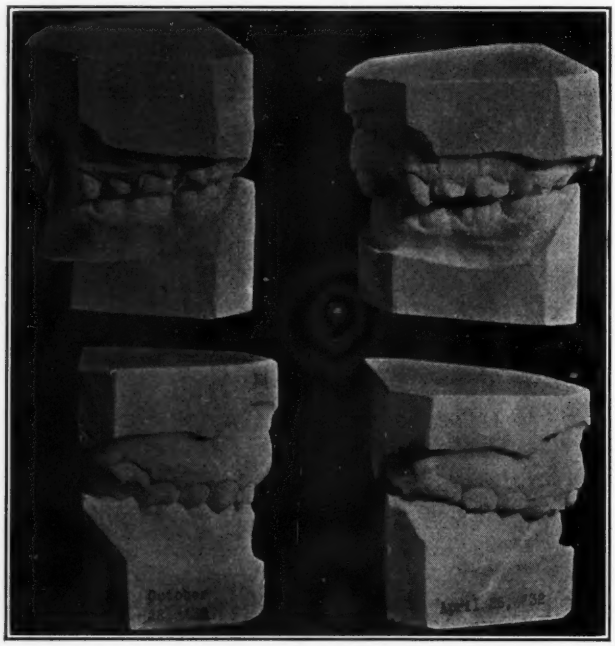

Fig. 8.

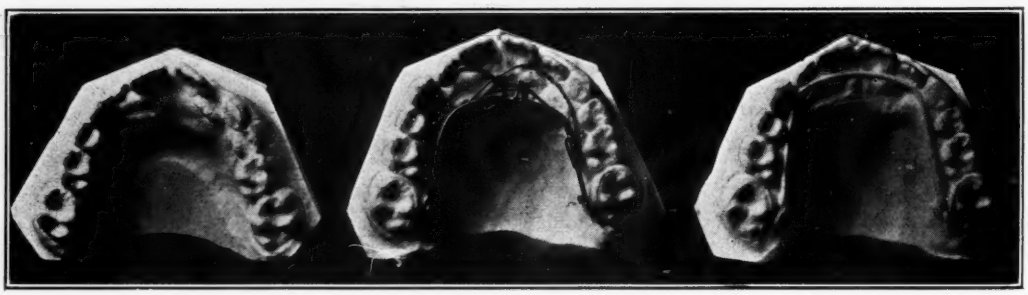

Fig. 9.

There are many cases, particularly in mandibular arches where late in treatment the arch stands out so far in the mouth as to be a decided inconvenience to the tongue, leading to breakage. An arch that is readily interchangeable, as shown, is desirable.

The one piece lingual arch was first presented before the American Society of Orthodontists, April, 1931. Since that time I have used it as routine practice in practically all cases where the lingual arch was indicated (more than fifty cases), and have found that it has not only simplified procedure but has also presented increasingly apparent advantages.

HONORS FOR DOCTORS MERSHON AND HELLMAN

ON THE eighteenth of May, in the city of Philadelphia, the University of Pennsylvania held a celebration of a Half Century of Progress in Dentistry.

The convocation was held in the afternoon at the Irvine Auditorium. The exercises began with a series of pipe organ selections played by Dr. Morrison C. Boyd.

The invocation was rendered by the Rev. Walter Brooke Stabler, Chaplain of the University.

The introduction was delivered by President Thomas S. Gates and was followed by two essays: "The Biologist's Outlook on the World" by Prof. Herbert S. Jennings, of Johns Hopkins University, and "The Relationship of Dentistry to the Public Health" by General Hugh S. Cumming, Surgeon General, U. S. Public Health Service. General Cumming wore the gown of the American College of Dentists.

Following these addresses was the conferring of honorary degrees:

For the Degree of Doctor of Science,

Herbert Spencer Jennings,	Presented by Clarence E. McClung
John Valentine Mershon,	Presented by William Dwight Tracy
Milo Hellman,	Presented by Joseph L. T. Appleton, Jr.
Leroy Matthew Simpson Miner,	Presented by Oborn G. L. Lewis
Charles Root Turner,	Presented by Alfred Stengel

For the Degree of Doctor of Laws,

Samuel Paul Capen,	Presented by George W. McClelland

After this came the benediction and recessional which was participated in by the men honored, the Officers of the University and the Faculty of the Thomas W. Evans Institute of Dentistry.

The following are the introductions of Doctors Mershon and Hellman:

By Doctor William Dwight Tracy,

John Valentine Mershon

Throughout your professional life you have been a generous contributor to progress in the science and art of dentistry.

In the highly specialized field of orthodontia you established and stimulated the physiologic concept of procedure. Your numerous papers and essays pertaining to the theory and practice of orthodontia have for years enriched our dental literature.

Your undergraduate teaching at the University of Pennsylvania and your postgraduate teaching throughout this country and in Europe as well have been of far-reaching value to the profession.

Your interest in the organization and administration of orthodontic societies and the fact that you have served as President of the Philadelphia

Academy of Stomatology, the New York Society of Orthodontists, and the American Society of Orthodontists proves your devotion to the cause of science.

As evidence of the high esteem in which you are held by your colleagues the Dental Society of the State of New York in 1930, made you a Fellow of the Society and conferred the William Jarvie Fellowship Medal for outstanding service to dentistry.

For these reasons and because of your distinguished success in practice and your meritorious service to humanity you have been invited by the Board of Trustees of the University of Pennsylvania to be present in order that you may receive an honorary degree. Mr. President, I have the honor of presenting John Valentine Mershon in order that you may confer upon him the degree Doctor of Science. President Gates then conferred the degree.

By Dr. J. L. T. Appleton,

Milo Hellman

I do not know whether you have ever felt or said:

"O wad some power the giftie gie us
To see oursels as ithers see us."

Well, be that as it may, my present task is to try to have you see yourself as you are seen by us.

As a teacher you have lectured at our own dental school and at Harvard. You have been Professor of Comparative Dental Anatomy and Professor of Orthodontia at the College of Dentistry of New York University. At present you are Professor of Dentistry at Columbia University.

For many years you have patiently and methodically carried on researches. As a sign of their worth you have been made Research Associate in Physical Anthropology at the American Museum of Natural History. Especially in two fields of pure science you have won prized recognition. Your studies in the development of the face and in the evolution of the human dentition are regarded as authoritative by paleontologists and by anthropologists. Here at Pennsylvania these achievements are a special cause of gratification. Here in the walls of our medical school Joseph Leidy laid the foundations of American vertebrate paleontology and here in our department of zoology Cope first indicated the lines along which the mammalian tooth and dentition had evolved.

According to legend your namesake, the Greek athlete, came to his death by trying to rend a tree asunder. Your fate has been more fortunate. You too have gone to the woods, but by following the tree-ape, Dryopithecus, you have traced the tree of man's descent.

Your interests and your endeavors in teaching and in research have not prevented you from attaining preeminence as a practitioner of orthodontia. Clinical success is not incompatible with unusual ability in teaching or in research. In fact they may be correlative variations. Not the least important lesson of your life and work is that the clinician (if he will) may gather a few of Newton's pebbles from the shore of the unknown.

As a human mother, but without the blindness of partiality, your *Alma Mater* has followed your career, with approbation and with pride.

Mr. President, I have the honor to present Milo Hellman for the degree of Doctor of Science.—President Gates conferring the degree.

The exercises were continued in the evening at the Bellevue-Stratford Hotel. A dinner in celebration of a "Half Century of Progress in Dentistry at the University of Pennsylvania" started the evening. This was attended by some three hundred persons, including officers of the University, the Honored guests, members of the dental and medical professions both from Philadelphia and from Baltimore, Boston, Buffalo, Washington, and New York. The occasion was graced by the presence of the ladies. Among the orthodontists outside Philadelphia who attended were Doctors H. U. Barber, Jr., George S. Callaway, Joseph D. Eby, Norman L. Hillyer, H. C. Hopkins, Harry E. Kelsey, Franklin A. Squires, Ralph Waldron, L. M. Waugh, and Glenn Young. That two orthodontists were included in this first small group of dentists to be so signally honored is the source of much pride among their colleagues. In Dr. Mershon they have long recognized a leadership in thought and practice, both so freely given, that has won full respect and deep gratitude. In Dr. Hellman is recognized the outstanding researcher among the orthodontists. His investigations in anthropology and paleontology are more widely known and accepted by scientists in general than is the research of any dentist.

After a very pleasant repast, Dean Charles R. Turner spoke of the antiquity of dentistry and its gradual rise from the sphere of the artisan to the dignified position it now holds among the learned professions. He then introduced Dean Leroy M. S. Miner who spoke with characteristic thoroughness on "The Field of Dentistry." Dean Turner then introduced Chancellor Samuel Paul Capen of the University of Buffalo, whose address was entitled "The Relation of Medical to Dental Education." Dean Capen has been a true friend of dentistry and has done much to elevate the training of the dental student in the fundamental sciences in the University of which he is chancellor. The last address of the evening was delivered by President Thomas Sovereign Gates, University of Pennsylvania, entitled "The Dental School in the University." His words were forceful and especially inspiring to all who have worked with eager faith for the elevation of dentistry. The outstanding reaction of the appreciative audience was one of deep gratitude to the University for the signal honor conferred upon dentistry and no special group was happier than the orthodontists.

DEPARTMENT OF
DENTISTRY FOR CHILDREN

WHAT SHOULD AN EXAMINATION OF THE CHILD INCLUDE?*

S. H. McAfee, D.D.S., New Orleans, La.

INASMUCH as teeth begin to develop before birth and are influenced by the physiologic equilibrium of the mother, it would seem logical that examination into the child's dental welfare should begin before birth if the dentist is to be seriously charged with the duty of rendering thorough dental service.

An examination of the child at the first opportunity should include:

1. Its age and general physical picture in regard to developmental defects that may be factors influencing its dentition and subsequent dental health. Examination into matters of the child's physical well-being, nutrition, habits—pernicious or otherwise—as related to dental development, is as important as looking for cavities to fill.

2. The number of teeth present and their condition; shape and relation of arches, position of erupted teeth, evidence of pernicious habits—thumb-sucking; mouth-breathing; possible presence of respiratory obstructions—adenoids, etc. The same observations should be made at all subsequent examinations.

3. Careful examination for the beginning of caries from three years of age on, with special attention to proximal surfaces of deciduous teeth. Occlusal cavities being easily discovered and filled.

4. If the first dental examination is sought as a consequence of pain, its cause and remedy should be found.

5. X-ray examinations should be made at any time essential or helpful to correct diagnosis—pathologic or developmental.

6. If deciduous teeth have been or must be prematurely lost, the necessary observations for space retention or acquirement should be made, explained and recorded.

7. Careful examination should be made of the soft tissues of the oral cavity, and deviations from health thereof should receive systemic as well as local consideration.

8. Development of the arches as indicated by the spacing of deciduous teeth should be noted. Special attention should be given to the relation of the first permanent molars as soon as erupted in regard to possible malocclusion

*This paper was read before The Spring Clinic of the First and Second District Dental Society of Louisiana, New Orleans, May 20, 1933. Permission to publish this paper is granted through the courtesy of *Impressions*, the Journal of the Louisiana State Dental Society.

thereof and its malinfluence on the entire permanent dentition. Parents should be advised and the facts carefully recorded.

9. During the period in which deciduous teeth are being lost and the permanent teeth are being erupted, examinations should be made as frequently as the conditions indicate, with prevention rather than cure the motif.

10. Examinations for defects in permanent teeth should be critically made at sufficiently frequent intervals to insure discovery and remedy before damage results.

EXAMINATION IN PEDODONTIA*

Leo J. Schoeny, D.D.S., New Orleans, La.

A THOROUGH examination is essential to a correct diagnosis, which in turn is necessary before proper treatment can be instituted. These facts are indisputable and show conclusively that the examination is of primary importance and that unless it be thorough in every detail no prescribed treatment can be of much value to a patient. Any small detail overlooked in the correlation and consideration of all symptoms, manifestations, history, etc., may place a wrong interpretation upon the sum of our findings, resulting in a faulty diagnosis.

We all appreciate the truth of this as applied to medicine, but do we attach the same importance to it in its application to dentistry? Perhaps we do and our failure to detect many disorders before the development of further harm both dentally and systemically, is in a majority of instances due to a lack of understanding of all that the examination should embody. This is true of the dental examination in general, but I shall limit my remarks in this discussion to the examination of the child patient.

The examination of the little patient calls for a great degree of skill and conscientious effort and adds to the responsibility of the dentist. A failure to detect any disorder at this time will allow it to develop and frequently lead to some irreparable damage, affecting the entire future of the individual. The early recognition and correction of conditions which deviate *from what we consider normal* offer us the real opportunity for prevention. I have emphasized this statement because it is my desire to suggest that what we now consider normal may not really be so and to direct your interests toward a study in this connection. Aside from this phase of the problem, however, we are faced with the fact that numerous diseased or disordered conditions with which we are familiar are not uncovered or detected in the usual dental examination of young children. Our failure to discover these conditions at this stage, when offered the opportunity, is probably because we are not familiar with any definite method for making such an examination. We must familiar-

*This paper was read before The Spring Clinic of the First and Second District Dental Society of Louisiana, New Orleans, May 20, 1933. Permission to publish this paper is granted through the courtesy of *Impressions*, the Journal of the Louisiana State Dental Society.

ize ourselves with and adopt some standardized outline of procedure for the routine examination of the child patient.

In speaking of the routine examination of the child patient, I refer to the primary examination of the new patient, when it is of the utmost importance to secure a thorough index of the patient's exact condition. All subsequent examinations may vary, depending upon the original findings and upon later developments. This routine examination should include a consideration of the family history, family characteristics and traits, inherited abnormalities, blood dyscrasias and specific constitutional systemic diseases. It should then include the past history of the patient, because we should be mindful of the possibility of the little patient's having suffered in the past with calcium deficiencies, scurvy, rickets, endocrine imbalance, etc. The method and kind of feeding, whether artificial or breast fed, and the child's habits during

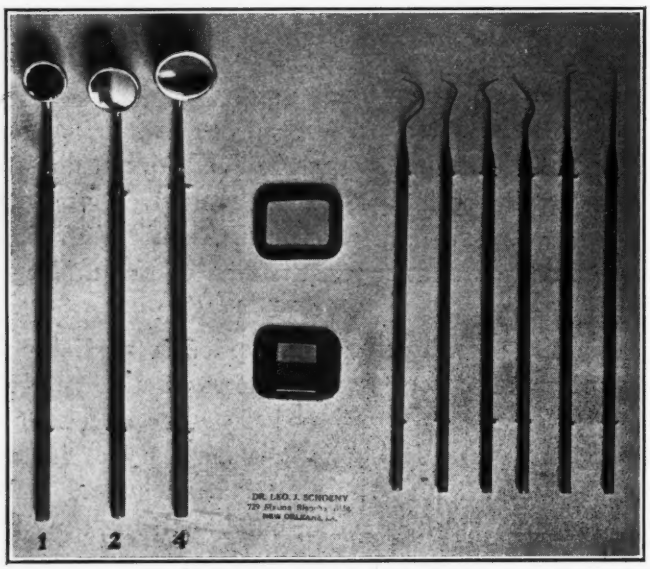

Fig. 1.—Mouth mirrors Nos. 1 and 2 are correct sizes for use on children. No. 4 is too large. This also illustrates a set of suitably designed explorers and the Victor Bolin junior film for the full-mouth, roentgen ray examination. Note index tab attached to lower film for the interproximal examination.

infancy are all very important in the interpretation of our findings and in outlining plans for the future care of the patient. The present age and general health of the patient, including condition of tonsils, adenoids and sinuses should be noted. The weight, appetite, daily diet, mode of living, present habits, and mental make-up of patient, whether above average, average, or below average, should be considered and recorded.

The general condition of the tongue and mucous membrane should be noted and tooth-brushing habits discussed. The vitality of all teeth should be determined. Laboratory tests should be employed whenever necessary for proper diagnosis. This examination should reveal the presence of all dental caries, even in its incipient stage. It should disclose susceptible areas, as deep sharp pits, crevices, sulci, unclean approximating surfaces and rough margins of restorations. It is important to discover these susceptible areas

early so that proper steps may be taken to prevent caries from beginning. Caries is largely preventable, and yet it is unquestionably the most common and prevalent disease which comes under our observation. All prematurely removed teeth, whether deciduous or permanent, should be recorded with reason for removal and date of operation if possible. The examination should disclose the presence of any supernumerary teeth, the absence of any missing permanent teeth and determine the probable cause, whether hereditary or due to an endocrine disturbance or from some pathologic or mechanical cause. The type of occlusion and size and outline of arches should be noted.

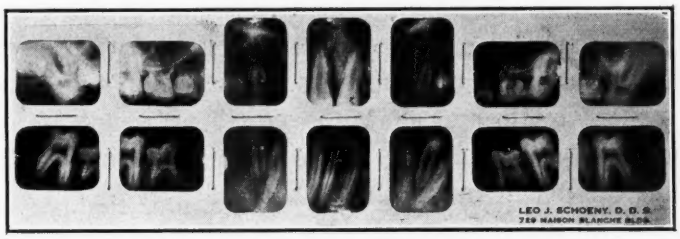

Fig. 2.—Patient thirteen years of age. Note absence of about seventeen permanent teeth.

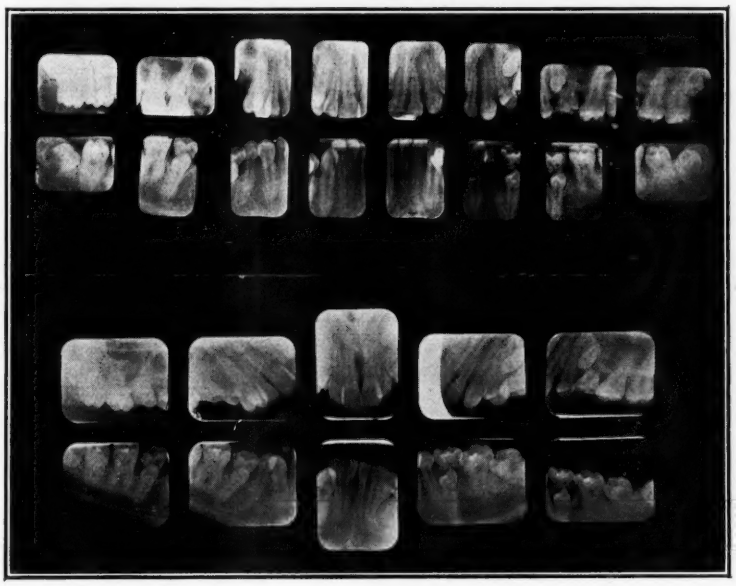

Fig. 3.—Patient aged thirteen years. Small arches, showing examination of the same mouth with ten standard-sized films and with sixteen Victor Bolin junior films. While the standard-sized film examination is far below average, we must admit much more satisfactory results are possible with the junior film, which permits correct positioning because of its size.

In our examination for caries all surfaces of the tooth should be gone over very carefully, using instruments of a size which permits effective work without discomfort to the patient. Too often we attempt the use of instruments which are entirely too large for the small child. Explorers with extremely fine and sharp points are essential. The mouth mirror must be without any blemish and should be small. Nos. 1 and 2 have been found to be the most practical sizes for use on the child. (See Fig. 1.) All food débris and deposits must be removed from the teeth and dryness of the surfaces maintained during the examination. It is not always possible to examine the

approximating surfaces or the cervical margins of restorations on the approximating surfaces of teeth in close contact by this means, however; and in such cases we must resort to the roentgen ray examination. This condition is found in a majority of cases, and when we consider this and the fact that the greater portion of the structures that should be examined and studied are hidden from view in the clinical examination, we must realize that our examination of the child cannot possibly be complete without including a full-mouth, roentgen ray examination and diagnosis.

Our full-mouth, roentgen ray examination of the child not only will disclose incipient caries on the approximating surfaces of the teeth, which was otherwise hidden from view, or the relationship of the carious area to the pulp, but will definitely reveal the presence of any unerupted supernumerary teeth, impacted permanent teeth, and show the possible absence of any unerupted permanent teeth. (See Fig. 2.) It will determine the stage of development or absorption of the deciduous tooth roots, the degree of development of the permanent teeth and the position of the unerupted permanent teeth. It will

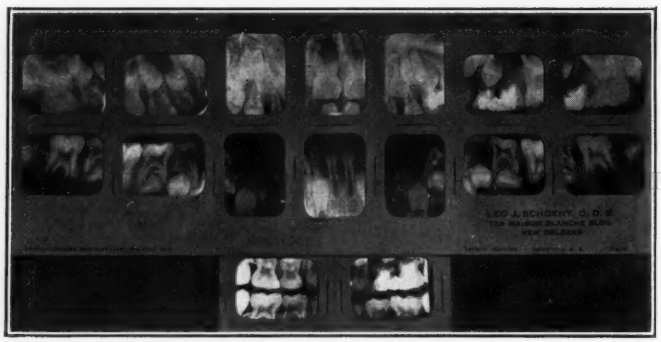

Fig. 4.—Full-mouth examination with fourteen films supplemented with two extra films for interproximal examination. This film for the interproximal examination is made by attaching an index tab, to be held between the teeth. Note absence of permanent successor to maxillary right second deciduous molar.

also show the results of infection, injury and pathologic changes in the osseous tissue and offer a means to study these structures. The roentgenogram should include all of the crown portion of the erupted tooth and the entire area occupied by the unerupted permanent tooth, extending sufficiently beyond to show its degree of development. The roentgenogram covering this area will give us much valuable information, but its findings should not be conclusive. It should be used to supplement our other findings. And then too, we must bear in mind that if the roentgenograms are to be of any value, they should be obtained by following some standardized technic. Furthermore, it requires the use of a film which permits of correct positioning without pain or discomfort and which requires a minimum exposure. The value of the small size film is illustrated in Fig. 3. Angulation and time of exposure are of paramount importance. The Victor Bolin junior lightning speed film, requiring one-quarter second for exposure, meets all of these requirements. It further requires that the operator have a thorough knowledge of embryonic development, histology, pathology, and anatomy and of dentistry in general

so as to interpret the findings when correlated or considered with the clinical findings. Sometimes it is necessary to supplement the regular fourteen-film examination with two or more views of the interproximal surfaces as shown in Fig. 4. It is extremely important to obtain the mental acquiescence of the child, because without his confidence and cooperation no satisfactory examination is possible. Providing relief of pain or discomfort is the first step preliminary to complete examination proceedings. The necessity of having good light whether natural or artificial is another important question and cannot be overemphasized.

In conclusion, I wish to repeat that it is necessary for us to adopt some standardized procedure in mouth examination for our little patients. I believe this outline gives some degree of standardization and offers information which will be of real value for statistical and educational purposes and of maximum assistance in arriving at a correct diagnosis.

PATHOLOGIC CONDITIONS OF THE SOFT TISSUES IN THE CHILD'S MOUTH*

HAIDEE WEEKS, D.D.S., NEW ORLEANS, LA.

THE most highly developed specialty of medicine of today is dentistry. The dentist, the physician, and the public today realize the definite relationship of the mouth to the rest of the human structure, both in health and in disease.

The child's mouth is more often neglected than given proper care. Were it not for the protection that pain brings, the neglect would be still greater. The reason for this neglect is twofold. Ignorance on the part of the parent, or guardian, is responsible for some part. Disinclination, or inability, on the part of the operator to face the peculiar conditions incident to childhood is the basic factor in a large number of cases.

In every art there are rules which have been worked out by experience. The genius, the master mind, rises above these rules, but ordinary mortals must work by them, and gather a little here and a little there.

Absolute truthfulness is essential to any sort of successful relationship. Deceive the child once, and his confidence is gone forever.

In this paper, no consideration will be given to the alveolar abscess and its sequelae; the condition and its cause, with which we are all so familiar.

Dentition may be defined as a physiologic process by which the child is supplied with teeth. It begins with the formation of the tooth germ at about the middle of the second month of fetal life, and ends with the establishment of the permanent third molars in the arch.

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While the eruption of the teeth is a physiologic process, it is nearly always associated with disturbances of function which are pathologic. The process by which the tissues are forced out of the way is one of absorption under pressure. The cusps of the teeth act as the irritant which produces the stimulant to the absorption, in consequence of which the tissues are tender and painful. A hyperemic condition can be noted, at a glance, besides the other phenomena accompanying inflammation. In severe localized inflammation, the lancet should be used, under aseptic precautions, to relieve the pain. The parts become hot, and a desire is manifested to bite cold things in order to relieve pressure irritation. This is Nature's provision for forcing the gum tissue away. The infant may aid Nature by the use of an ivory or silver ring.

Faulty nutrition, undue density of the overlying tissues, or other complicating circumstances, may interfere with the process of dentition, and we may occasionally encounter complications which even endanger the life of the infant.

In examining the mouth of the infant, we should look at the regions where, according to age, the tooth should erupt; we should examine for lesions of the mucous membrane and for abnormal frenum.

An abnormal frenum lingual may cause fretting and difficulty in nursing, not allowing the infant to use the tongue in swallowing. The frenum should be removed by clipping from the under surface of the tongue, and from the floor of the mouth, holding the tongue with a pair of forceps.

In examinations of children's mouths, we frequently see small vesicles about 2 mm. in diameter, surrounded by a reddened zone. These soon rupture, forming ulcers with grayish bases and bright red margins. The ulcers are sunk into the tissues, and the slightly indurated margins stand above the surrounding areas. They most frequently occur on the margins of the tongue, and on the inner surfaces of the lip and cheek. These conditions are usually associated with attacks of nervous indigestion. Children often refuse to feed on account of pain.

Tubercle bacilli have been found repeatedly in the scrapings from carious cavities in children otherwise free from the clinical evidence of tuberculosis. These findings may account for a considerable number of infections occurring in childhood or adolescence, and render imperative the treatment of caries in the child's mouth. Many other pathogenic organisms have also been found in caries.

In the last year, there has been a great increase in cases of Vincent's infection in young children. There seemed to be quite a difference in opinion among pediatricians as to the diagnosis.

Among most diagnosticians it is agreed that oral sepsis is the chief predisposing factor; yet some disagree that cleaning the teeth should be done until the symptoms have been brought under control by medication. Medicaments are as diverse as their advocates; though all dentists agree as to the value of oxidizing agents.

There are three types of Vincent's infection, namely, acute, subacute, and chronic.

In the small child, as far as I have seen, there is only one type of Vincent's found, the acute. It involves the gingivae in one or both jaws, and is

characterized by highly inflamed peridental membrane, temperature, distinctive fetid breath and, sometimes, the grayish slough seen in the adult. The patient suffers pain, prostration, and loss of appetite. In the child, more often than in the adult, the lips, inside of the cheek, the tongue and tissues are involved. In two cases there were enlargements of the knee joint, which indicated a rachitic condition. The majority of these cases which have come under my observation occurred at the time of the eruption of the second deciduous molars, the flap over the erupting tooth making an ideal harbor for the incubation of the organism. In the treatment of these cases, there is as much diversity of opinion as there is to name but, as most are agreed, the condition is caused by oral sepsis; hence the most effective way of treatment is ridding the mouth of infecting organisms, bringing about a speedy cure. Establish good hygiene as soon as possible. Many of the prolonged cases of Vincent's infection are probably because of the older conception of "drugs first and cleanliness afterward."

The anaerobic organism can live only in an environment of lowered oxygen tension, hence the use of oxidizing agents. The mouth is sprayed with a solution of sodium perborate for several minutes. With small cotton rolls the areas are isolated, and a 5 per cent chromic acid is applied. The child is given an orange and tomato diet for two or three days. The bowel movement is accelerated with milk of magnesia. The patient is seen as often as necessary. A sodium perborate solution is used at home every hour, and the patient is told to hold it in the mouth to make bubbles.

There is always a history of bad feeding, and accompanying lack of prophylaxis in these cases. In contradistinction with the recurrence in the adult mouth, there is no recurrence in the child's mouth. Perhaps the molar on its eruption, provided the harbor for the incubation, and when it was erupted, effaced the pocket.

Metastatic osteomyelitis, which is caused by the spread of an infecting agent from bones or tissues, must be preceded by a bacteriemia, that is, living bacteria must be borne by the blood, and lodged at a point that is receptive. The resulting lesions depend upon the resistance of the body, as a whole, to the infection, and upon the resistance of the local areas against the invasion and establishment of the bacterial colonies. The maxilla and mandible are among the bones frequently involved. The cortical portion of the bone, since it is inert tissue, needs little blood to keep it alive, and is more often attacked by infections.

CASE 1.—White male child, aged four years. Physical examination: undernourished; swelling over right mandible; sinus draining through cheek near angle; sublingual glands, swollen. Oral examination showed all teeth loose, much decay, and a sequestrum from right canine to tuberosity, and pus exuding from the necks of all the teeth. The culture made showed *Staphylococcus pyogenes aureus* predominating. This child was undernourished, and had had a rachitic condition since birth.

CASE 2.—Baby, eighteen months old. Past history negative. Child was an inmate of an institution. Teeth erupted normally. Child was found, one morning, with two maxillary central incisors missing. Had apparently been well the day before. Temperature, 104°. Bacterial examination of culture of mouth and throat was reported as "septic sore throat,"

which, of course, meant nothing. Further cultures were made which showed a predominance of *Staphylococcus pyogenes aureus.* A condition of metastatic osteomyelitis resulted. Death followed in five days.

Cultures were made of all the other children in the institution, and revealed several such throats.

The nurse was taken to an infirmary with erysipelas.

This baby's death was the first in the institution in two years.

CASE 3.—Child, eight years of age. History: Child impoverished and undersized. At eighteen months, pneumonia with lung abscess. Family history: Father syphilitic. When the child presented, there was pus exuding from tuberosity to tuberosity on the upper jaw, and from ramus to ramus on the lower jaw. There was an extensive sequestrum on the lower. The child had to be carried.

All teeth were extracted, and a diet was prescribed.

Osteomyelitis developed in the maxilla, a flare-up of the lung abscess occurred. Death followed.

A gingivitis is found, generally, around the mandibular incisors in the child at about the age of six years, when there is malocclusion, and poor mouth hygiene. With the most excellent home care instituted, the cases did not greatly improve until after orthodontia treatment was given.

In my opinion, our one important responsibility is to differentiate between an ulcerative stomatitis, gingivitis, Vincent's infection, and parasitic stomatitis. It is true we do, but rarely, see cases when the ulcerative stomatitis is superimposed on a Vincent's infection, or vice versa.

Thrush is seen in very young children on the mucous membrane caused by *Oidium albicans,* belonging to the yeast family, and presenting branching filaments and spores. It rapidly develops in unclean mouths, especially when catarrhal conditions of the mucous membrane are present, and acid fermentation of food remnants is permitted to occur. This attacks the tongue first, then rapidly spreads to all mucous surfaces and appears as slightly raised, pearly white, spots which gradually enlarge and coalesce. The ulcers should be touched with a 5 per cent solution of silver nitrate.

The mouth should be kept scrupulously clean, and an alkaline mouth wash should be used to relieve the burning sensation. The general health should be taken care of by a physician, as it will be found that the child's nutrition is poor, presenting some marked disturbances in digestion.

Catarrhal stomatitis is characterized by redness and swelling of the mucous membrane and by increased salivation. It involves a large part of the mucous membrane. Catarrhal stomatitis may result from trauma. The injury may be mechanical, due to heat or any irritant accidentally taken into the mouth. It is most often seen at the time of the eruption of a tooth. There is congestion with desquamation of epithelial cells, and sometimes formation of superficial ulcers. The lesions are, as a rule, superficial but may extend to the submucous tissue. The whole mucous membrane is intensely inflamed, all capillaries are dilated, and small hemorrhages are easily excited. The mucous membrane is swollen, being most apparent on the peridental membrane over the teeth. The lips may also be swollen. The mouth seems hot and local temperature increased. There is considerable pain as shown by fretfulness,

and the disinclination to take food. The saliva pours from the mouth, drenching the clothing. The tongue is coated, edges are reddened, and papillae are prominent. Constitutional symptoms accompany this form of stomatitis but are not severe; however, some disturbance is always present. In the majority of cases the disease runs a short course, recovery taking place when the primary symptoms are removed. The mouth and teeth should be kept clean. Cold food is most acceptable, as is chopped ice. Dobel's solution with an equal amount of cool boiled water may be used as a mouth wash.

Herpetic or aphthous stomatitis. In this form of stomatitis there are, first, the appearance of small yellowish white spots, and subsequently, the formation of superficial ulcers, which coalesce and form ulcers of considerable size. The course is from four to five days to two weeks, as it is self-limited. Forcheimer and Holt believe it to be from a nervous origin. It occurs from about the tenth to the sixteenth month.

CASE 4.—A child, aged three years, was carried into the office and put in the chair. There was a history of refusing food for several days; temperature 101°; and general malaise. The parent had discovered the child had a sore mouth. Upon examination of the mucous membrane of the cheek adjoining the peridental membrane, and on the tongue were found vesicles about 4 mm. in diameter, surrounded by a reddened zone. Some of these had ruptured, forming ulcers with grayish bases and bright red margins. The ulcers were sunken into the tissues, and the slightly indurated margins stood above the surrounding areas. *Treatment:* The area was isolated with small cotton rolls to prevent the spread of the medicament, and each vesicle was touched with the solution. Beechwood creosote 1 dram, iodine crystals, saturated solution Qs.

The pediatrician was called in consultation, and a diagnosis of scurvy was made.

Many times the dentist makes this diagnosis because the child is brought to him on account of a sore mouth.

My first experience with this condition was in 1915, when seventeen children from one institution were sent to the clinic. Fourteen of these children were hospitalized. This condition was reported at a meeting of this organization in a plea for help, as some of the cases were in such a condition that, at that time I could only liken the condition to noma, but was confident it was not noma because the children had had the condition for more than seventy-two hours and had survived. One pint of orange juice was given to each patient every day with cod liver oil, milk and sunshine.

We find more of these cases during the months of January and February, following the usual winter diseases in this climate, when the resistance is low, and there has been poor or scanty nourishment, and no mouth hygiene. In 80 per cent of these cases there was great loss of both hard and soft tissues. Our cold weather begins in November and December. The infections which are continued through six winter months in the children in a more northern climate are experienced by our children during only two months, November and December. The children lack the necessary green vegetables and fruits during these months, and the milk is less rich and more expensive. There is a relative deficiency of fat soluble A vitamins, and the water soluble B vitamins during these months. This, while not producing actual lesions, certainly is a factor in bringing about an impairment of nutrition sufficient to account

for the diminished cell resistance, a predisposing cause, at least, of the more extensive ulcerative processes we see during the winter months.

Ulcerative stomatitis. This is a condition seen when teeth have erupted. It is characterized by an ulcerative process of the gingivae and extends along the side of the mouth, and, secondarily, involving other parts of the mouth. It is readily curable by internal administration of chlorate of potash, which we may consider as specific. It may occur as a sequela of an acute infectious disease. The majority of these cases are found, in hospitals and institutions, in children whose general health is below par and who have not had proper nourishment.

In private practice, it is rather a rare disease, except among pampered children whose parents are too busy with social activities to take the proper care of their children's mouths, and whose food is given them by ignorant servants.

This is the stomatitis which we see in scurvy, and it is not at all unlikely that an allied disturbance of nutrition causing a spongy swollen condition of the peridental membrane is present prior to many cases of ulcerative stomatitis. In this condition, it is easy to see how germs present in the oral cavity may set up an active inflammatory process: the diminished vitality from general health taking the primary cause and infection, the secondary. Bacterial examination showed only the ordinary pyogenic bacteria.

The lesions begin in any part of the mouth, but most frequently along the gingivae of the mandibular incisor teeth. It appears on one side of the mouth only, but may cover the membrane of the whole mouth, the inner surfaces of the lips and cheeks. The condition in neglected cases causes the loosening of the teeth, which, many times, have to be removed. The periosteum becomes involved and also superficial necrosis of the mandible is present. As a rule, the first symptoms noted are foul breath and profuse salivation. It is for the breath, more often than not, that the patient is brought in for treatment. On inspection, the mouth shows spongy peridental membrane, very red and purplish in color, which bleeds at the slightest touch. There is a line of ulceration along the gingiva which, many times, extends over the whole mouth. The gingiva has a dirty yellowish deposit which, when removed, causes free bleeding to take place. The membrane is very painful.

In more advanced cases, the peridental membrane entirely covers the teeth, which become so loose that they can be picked out. This is particularly so in the scorbutic form. The lymphatic glands are swollen and very painful; the tongue is swollen, and decubital ridges are found on the edges showing the imprint of the teeth. In several of these cases, gangrene has followed.

Ulcerative stomatitis may last for a month if not properly treated. When an early diagnosis is made and proper treatment used, the patient tends to recover rapidly, and no mouth deformity is left.

Ulcerative stomatitis can scarcely be confused with any other form and not only should a diagnosis of the lesion be made, but the predisposing cause should be discovered. Scurvy, in particular, should not be overlooked. First, remove the cause.

In scurvy cases, an antiscorbutic diet is given. Oral prophylaxis is insisted upon, with a sodium perborate solution used every hour at home. Chlorate of potash, 2 grains, or ½ teaspoonful of saturated solution diluted in a little water, is given every hour for thirty-six hours. The constitutional and dietetic treatment should be employed, as in any scorbutic case. Plenty of orange and tomato juice, fresh vegetables, and milk should be given.

When the little patient comes to us with a painful condition in his mouth, the operation must be done, cost what it may. Children bear a shock of this kind well, and recover promptly. Be firm, be quick. The child appreciates success even more fully than does the adult. Prompt success with a child is of the utmost importance in controlling him in the future. Failure forfeits his friendship.

1203 Maison Blanche.

DO MOUTH TISSUES PRESENT DEPENDABLE EVIDENCE OF CERTAIN PATHOLOGY?*

Mabel Fontane Wood, B.A., D.D.S., New Orleans, La.

REGARDING the oral cavity as the chief portal of entry to the human organism, it is evident that a healthy mouth containing normal and efficient complement of teeth is a primary factor in the well-being of a child.

Mouth tissues do present dependable evidence of pathology. For convenience, we enumerate the diseases of childhood with oral symptoms as follows:

Fevers.—(Lack of salivary secretions together with specific changes in mucous membrane tend to cause inflammation of the mouth and gums.) In certain fevers the characteristic skin rash appears in the mouth, and in some diseases of the skin, the mouth manifestation is usually the only one. Among the fevers in which rash may be seen in the mouth are smallpox, scarlet fever and measles.

Purpura.—A disease characterized by a formation of purple patches on the skin and mucous membrane due to subcutaneous extravasation of blood. We list purpura fulminans as a rapidly fatal purpura of young children.

Scurvy.—One type known as scurvy rickets is seen in bottle-fed children who have been fed on sterilized milk without addition of any raw fruit or vegetable juice. It is termed scurvy rickets from the fact that manifestations of rickets, impaired calcium metabolism and symptoms of scurvy occur together. Another form of scurvy is infantile scurvy, or Barlow's disease, also due to deficient vitamin diet.

*This paper was read before The Spring Clinic of the First and Second District Dental Society of Louisiana, New Orleans, May 20, 1933. Permission to publish this paper is granted through the courtesy of *Impressions*, the Journal of the Louisiana State Dental Society.

Tuberculous Ulcerations.—Chronic inflammatory conditions in mouths of children may certainly be regarded as predisposing to tuberculous adenitis.

Diphtheria.—Although the usual site of this disease is the pharynx, tonsil or soft palate, diphtheritic ulcers of the buccal mucous membrane are not uncommon. Any portion of the mouth, gums, lip, tongue or cheek may be infected.

All *syphilitic lesions.*

Thrush.—A disease of infants attended with formation of whitish spots in the mouth, often attended with fever and gastrointestinal irritation.

DIFFERENTIATION BETWEEN VINCENT'S INFECTION AND ULCERATIVE STOMATITIS*

SIDNEY L. TIBLIER, A.B., M.S., D.D.S., NEW ORLEANS, LA.

THE round table discussion of this broad subject brought out many interesting angles and opinions. The discussers were all fairly recent graduates, but young men of energy and foresight and all interested in children's dentistry; some are associated with welfare clinics, hospital clinics, and school clinics.

The first significant point brought out was that neither Vincent's infection nor any other form of ulcerative stomatitis was common in their private practices. Second, that ulcerative stomatitis of various types was found frequently in the underprivileged class of school children. Vincent's infection (that is purely of the mouth) is not commonly found as such in any of the classes above described. Mixed infections in which the Vincent's organisms are found are more common, but in most cases the symptoms could more properly be attributed to other pyogenic organisms. All agreed that clinical symptoms alone should never be depended upon to make a diagnosis of Vincent's infection; although the objective symptoms would lead us to diagnose cases where ulceration existed as ulcerative stomatitis or gingivitis. Subjective symptoms are not so valuable as far as children are concerned.

The term ulcerative stomatitis covers a multitude of pathologic processes whose end-result is ulceration. All cases should be diagnosed positively by microscopic examination of the smear or cultures made from the lesions.

The smears should show an abundance of the Vincent's organisms together with the fusiform, with any other complicating infectious organisms in the minority.

Many forms of ulcerative stomatitis common to children were discussed, some purely local, others local manifestation of acute and chronic systemic disease.

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The final conclusions on the subject under discussion were as follows:

1. That Vincent's infection as a specific local disease does not stand out symptomatically (objectively or subjectively) well enough to be diagnosed by such considerations alone.

2. That both the acute and chronic forms should be diagnosed positively only by examination of the smears taken from the deeper areas of the lesions on account of the anaerobic character of the organisms.

3. That Vincent's infection although local is practically always found in children of lowered resistance and vitality, brought about by faulty diet and unhygienic living conditions.

As a general conclusion, children's dentistry and preventive dentistry call for more cooperation of the dentist and pediatrician and for a more intense interest in pathology on the part of the dentist.

921 Canal Bank Building

STANDARDIZED TOOTH BRUSHING*

G. O. Rosado, D.D.S., New Orleans, La.

WE HAVE had a very interesting discussion at our table, and it is the unanimous opinion of the members present that we should have standardized tooth brushing for children. In going over the literature, I can find very little written about the proper technic on mouth brushing for children. The information given is very indefinite in most cases.

We agree that it is very difficult to get the proper cooperation of the child, but the time to start is in early childhood.

The toothbrush is much more important than the dentifrice. A very common fault is that dentists do not stress the necessity of children having two brushes. It is best that these brushes have different colored handles, so that each morning and night a dry brush can be used. A dry brush can clean a great deal better than a wet one. Therefore, the brushes should be hung up to dry, in the sunshine, if possible.

The mother or nurse should brush the child's teeth night and morning until he is old enough to perform that duty himself.

Children should be taken to the dentist at about three years of age and should return for prophylaxis and examination every three or four months.

The technic which we have adopted and which we offer for consideration is:

1. Stand in front of a mirror.

2. Take at least three minutes to brush the teeth and gums, timing yourself with a sandglass or watch.

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3. Brush each area at least ten to twelve times at each brushing, using a wrist motion.

4. Brush your teeth after breakfast and before bedtime.

5. Begin on the *upper right side,* brushing *down,* proceeding around the arch on the outside, using a sort of a sweeping motion, sweeping or twisting from high up on the gum toward the biting surfaces of the teeth.

6. Next, brush the biting or chewing surfaces of the left and right upper teeth. These surfaces should be given a thorough scrubbing, allowing the bristle ends to penetrate deeply into the depressions or grooves.

7. Now brush the inside surfaces of the upper teeth in the same manner as the outside, except that in the anterior part of the mouth the handle of the brush is at a right angle to the long axis of the teeth.

8. On the lower jaw, follow the same procedure, except that instead of brushing down, you should brush *up.*

9. Now the tongue should be brushed, sweeping forward from the back with a light motion.

10. After the teeth have been brushed at bedtime, the surfaces in between the teeth should be carefully cleaned with floss or tape.

11. Finally the mouth should be filled with lime water or a warm salt solution, and the solution worked back and forth vigorously in order to remove all food débris.

SHOULD THE FISSURES OF FIRST PERMANENT MOLARS BE FILLED ON ERUPTION OF TEETH?*

M. B. Varnado, D.D.S., New Orleans, La.

BECAUSE of the importance of the subject of fissure cavities and their treatment, we at this table are happy to have been assigned for discussion the question of whether fissures of the first permanent molars should be filled on eruption of these teeth. The subject of the treatment of these teeth and the fissure class of cavities seems so neglected at times because of the seemingly larger importance of other mouth conditions that some one has well said, "Take your eyes off the apical end of the tooth and look at the pits and fissures."

Inasmuch as the lines of fusion at the junction on the lobes of the teeth are as normal as any other part of the tooth anatomy, let us differentiate between the normal and the abnormal in this portion of the tooth. These irregularities or indentations known as grooves are normal to the anatomy of the tooth and are thought to have a function as certainly as does the sharp edge of an incisor. Therefore the developmental grooves are normal in the developed tooth. Only when they are of unusual depth or when nature has

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failed completely to fuse the lobes, can these grooves be said to be abnormal. In such cases the groove is no longer a normal anatomic development, but an open fissure and a cavity.

Inasmuch as many grooves are not defective, we do not believe that such normal grooves should be filled immediately on eruption of the tooth or at any subsequent time. Only in case of the development of an actual opening in the groove should fillings be made. Neither do we believe that all these grooves should be rounded and polished as advocated by Dr. Prime, nor do we believe in the universal prophylactic or preventive procedure known as prophylactic odontotomy advocated by Dr. Hyatt.

Decay does not develop in the developmental grooves of a goodly percentage of teeth. Many teeth are immune.

The grooves of the first permanent molars cannot be too closely watched, however, for we are aware of the susceptibility of these teeth to decay in the sulci. Large cavites often occur while the opening on the surface remains minute. The importance of keeping these teeth under closest observation cannot be overrated.

We are aware that an enormous percentage of first permanent molars is lost and that their loss is due largely to decay originating in the sulci of these teeth; nevertheless, we do not feel the warrant for filling the sulci of these teeth unless there exists an actual opening, fault or fissure. Close all openings immediately on discovery. Make fillings as small as it is possible to make a filling, because no extension for prevention is necessary in this class of cavities, but fill immediately. Nothing can be gained, but much damage can be done, by leaving any opening in any tooth.

FILLING MATERIALS IN PEDODONTIA*

PRESCOTT E. SMITH, D.D.S., NEW ORLEANS, LA.

RESTORATION of lost tooth structure, brought about by dental caries in children's dentistry, may be divided into two principal groups: filling materials for deciduous teeth and those for the so-called permanent set. However, since the restorations of the latter have been so thoroughly discussed in the past, I shall confine my remarks to the more neglected deciduous teeth.

In the selection of filling materials we are governed by several factors; the principal of which, I think, is the ability or expertness with which the patient is handled. If we can inspire the confidence and patience of the child, our selection of materials will naturally have a wider scope and will be dependent upon the mechanical requisites of the remaining noncarious tooth structure, but if the patient is unruly and lacks patience, as is often the case

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in a sickly or spoiled child, then the elements of time and ease of manipulation become important features in arriving at the best possible solution as to our choice of filling materials.

We must also consider the life span remaining to the tooth in question. For example, in some cases a cement filling, though not restoring the proper tooth form and function as well as a gold inlay, will be adequate, where it is only a question of time before the tooth will be shed and the prevention of pain is the object in view. But if the remaining life span is about five or six years and approximal cavities have developed, we must consider the normal growth of the arch and select a filling that will properly and efficiently restore approximal contact, especially in the posterior teeth, and also maintain function as nature intended, because the child at this time is going through its greatest period of development, and proper mastication is very important.

Again, we must bear in mind the size and depth of the cavities presented, and the character and distribution of the enamel and dentin in deciduous molars; also that the depth of the cavity preparations and the undercuts necessary for the retention of plastic fillings, as Dr. R. C. Willett so aptly puts it, "not only endanger the pulp but also leave frail walls that as a rule will check, permitting leaks that invite recurrence of decay."

In a cavity of large size the filling material must be able to withstand the forces of mastication.

Finally, and probably least important of all in fillings for deciduous teeth, we must sometimes consider esthetics. This of course is in the anterior region of the mouth.

In discussing filling materials I shall first consider copper amalgam because, I believe, it is the most widely used. It is very easily manipulated, quickly placed, and when set has a high crushing strength. It has a definitely germicidal value because of the production of copper salts in the fluids of the mouth.

On the other hand, it is difficult to restore proper tooth form because of its slow setting process, during which time much care should be taken to prevent a change in its shape through any stress of a force. It discolors badly and is not indicated in anterior teeth where a more presentable type of filling can be used. It requires undercuts in its retention and must not be confined by fragile walls if the filling is to function properly.

Silver amalgam, contrary to the opinion of many operators, can be used with success in deciduous teeth, but just as much care should be shown as when it is used in permanent teeth. Its physical properties are well known, but, like copper amalgam, it cannot be supported by frail enamel walls with success. Unlike copper amalgam, it produces irritation when placed too close to the pulp.

Gold inlays should be shown more consideration in restoring lost deciduous tooth structure than has been the case in the past. I know of no better way to rebuild lost approximal contact points and tooth form more efficiently than with this type of filling. It does not require deep undercuts for retention as do plastic fillings and may be placed with least danger to the pulp pro-

vided dental caries has not progressed too far. It will also protect the weak enamel walls as is not the case in plastic fillings. It requires skill in cavity preparation and expertness in handling a child patient, but the end-result is so gratifying that it is surprising how few gold inlays are placed in deciduous molars today. Since they are almost wholly confined to posterior teeth, esthetics plays no part in their insertion.

Synthetic porcelain is used principally for its appearance, but germicidal kryptex may be used in deep posterior cavities with excellent results. However, in their insertion as in the case of all fillings that require extreme dryness of the cavity during the insertion, phenol should be previously used to seal the dentin tubulae to prevent the exudation of fluids normally found there and thus prevent washing from the inner walls of the cavity.

Cement should only be used as a temporary filling or as a cavity lining because of its susceptibility to washing out and its extreme shrinkage. Of all filling materials used in deciduous teeth, I believe cement rates lowest in properties necessary to a serviceable filling.

The question of economics is not included under the title of my paper, but many times in welfare clinics I have treated child patients whose parents found it burdensome even to pay for dental treatment of immediate nature and in many cases were unable to pay at all.

In these instances we are often presented with the problem of leaving in infected deciduous teeth treated with silver nitrate, or entirely too early extraction. Providing the child's resistance is high and no pain is felt, I do not hesitate to leave these teeth in the mouth, because they can be extracted at any future time, and they do serve as regulators for a fairly normal growth of the arch in contrast to crooked teeth, which they cannot afford to have treated, and their accompanying ills.

In conclusion, no particular filling material is universal in filling deciduous teeth. Let us study each individual case as we would any permanent set, and in so preserving baby teeth and arches prevent most of the dental ills of adult patients.

IDEAL FILLING MATERIALS IN CHILDREN'S TEETH*

F. Harold Wirth, D.D.S., New Orleans, La.

IN DISCUSSING ideal filling materials in deciduous teeth, we discussed possibilities of the use of the following materials: gutta percha, cements (including silicates), silver nitrate, gold inlays, silver amalgams and copper amalgams. The consensus of opinion showed no use for gutta percha save as a seal; partiality toward cements in anterior teeth and as a base; silver nitrate in anterior teeth and some molars in slice preparations; silver amalgams in

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many cases; and possibilities of the use of gold inlays in a technic as prescribed by Dr. Willett of Peoria. Copper amalgam proved to be most popular due to its ease of manipulation and its germicidal properties.

A good point advanced was the use of one part of silver amalgam to three parts of copper amalgam to hasten the setting time; it will set in approximately five minutes. A petri dish with a piece of copper amalgam placed in the center was infected and incubated for two weeks, at the end of which time a definite halo, free from bacteria, existed around the amalgam. Any doubt as to the germicidal properties of copper salts can certainly be clarified by this simple demonstration. We, of the round table titled "Ideal Filling Materials in Deciduous Teeth" of the First and Second District Dental Society of Louisiana, wish to go on record as strongly advocating the use of copper amalgam.

RESTORATION OF ANTERIOR TEETH IN THE CHILD'S MOUTH*

F. J. Wolfe, New Orleans, La.

THE consideration of the restoration and preservation of central and lateral incisors in children between eight and twelve years of age, in which injury has caused either loss of tooth or exposure and death of pulp, is one of the vital problems which dentists are daily called upon to face, and which I believe should be given more serious thought and consideration.

The restoration of a damaged tooth should approach as nearly the normal form as possible so as to preserve occlusion during the course of jaw development, for surely any deviation from the normal is bound to cause much irregularity of teeth, and ofttimes facial deformity which in later life will prove of much embarrassment and discomfort to the patient. Loss of lateral or central incisors at the tender age of eight to twelve years is bound to cause a lack of jaw development and necessary change or lack of development of the surrounding and supporting tissues, which will ultimately and certainly cause changes in symmetrical facial development that will prove a detriment to the child so injured.

The dentist who is so careless, thoughtless, or indifferent to any child's welfare as to give little or no attention to the preservation of his tooth or teeth should be severely criticized for such indifference and lack of appreciation in public welfare to which he dedicated himself when he received his diploma.

The damage of a devitalized tooth would be far less injurious to a child's health than the loss of that tooth. In my practice I have treated many root canals and restored the crowns of the damaged tooth to the normal contour, with much

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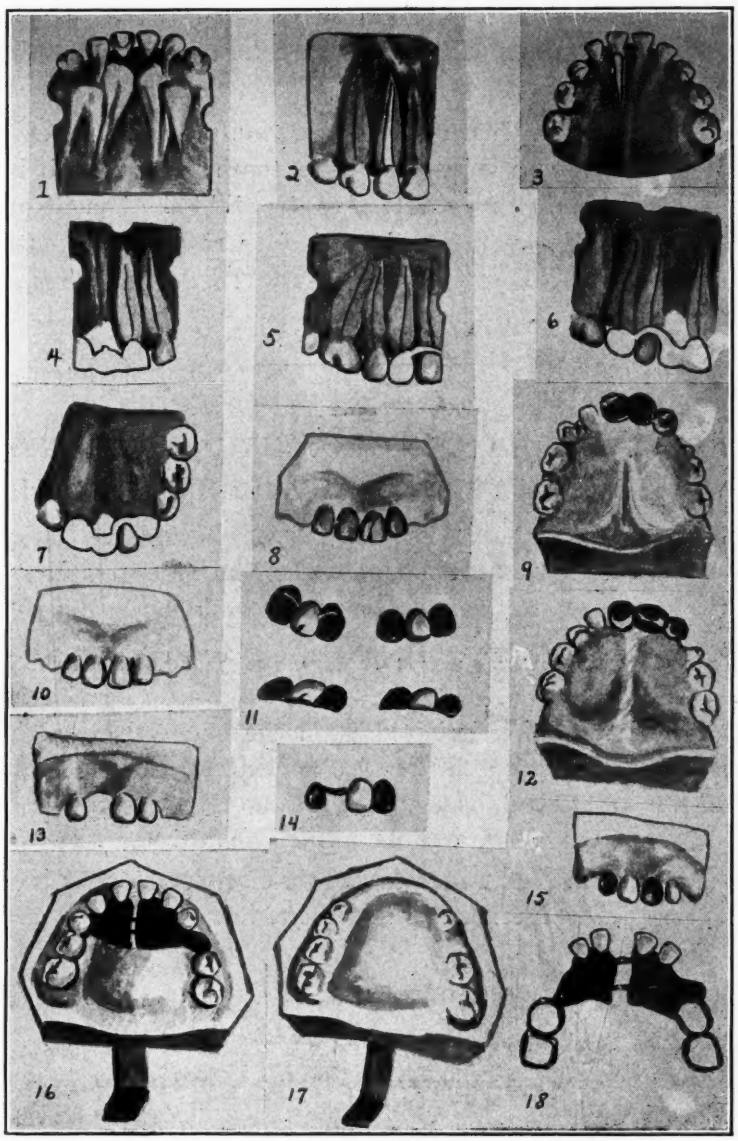
satisfaction of the patient, parent and myself With our present-day root canal therapy and filling there is no reason why we should extract a central or lateral for a child between the age of eight and full growth. Figs. 1, 2, and 3 are from x-rays of a few of the many similar cases I have treated: (1) Deciduous tooth at age three served until loss and replacement by the permanent



Figs. 1-18.

tooth. (2) Boy. Tooth devitalized at age seven still in place at seventeen years and giving excellent service. (3) Central incisor of girl twelve which has given service for past four years.

In cases where the tooth or teeth are lost three-fourths crowns make excellent abutments to carry the pontics as shown in Figs. 4, 5, 6, 7, and 9 while the open face crowns shown in 8, 10, and 11 are very undesirable be-

cause of the great danger of decay occurring at the gingival margin on the labial surface due to the disintegration of cement beneath the gold band. Figs. 14 and 15 show a similar restoration with full gold crowns; these are very undesirable for esthetics. I use only the cast three-fourths crown, since little or no damage is caused and esthetics can be maintained.

When teeth are lost as in Case 17 a removable appliance as in Figs. 16 and 18 is made which will permit of arch expansion, so that when full mouth development has been attained, the proper restoration of contour and tooth replacement may be inserted.

In closing, my friends, let me plead with you, that when a child has been so unfortunate as to have an injured anterior tooth, treat it as if it were your own; do not take the easiest way out; give the child the benefit of any or all the ability and knowledge you may have before resorting to extraction, for any one can wreck God's beautiful work—The Teeth, but where is the man who can restore them?

WHAT SHOULD BE THE DEFINITE ATTITUDE WITH RESPECT TO PERIAPICAL INFECTIONS OF DECIDUOUS TEETH?*

CHARLES SHEPARD TULLER, D.D.S., NEW ORLEANS, LA.

THIS table reports a division of opinion, one conservative and the other radical.

The conservative opinion is based upon the generalization that children need teeth as much as adults and that deciduous teeth should be preserved, if possible, until normally shed. This, as a means of promoting the welfare of the jaws, the permanent teeth, and the child's health.

We are also certain that under favorable circumstances it is much easier to eradicate periapical infections on deciduous teeth than it is on the permanent ones.

There are three conditions governing our procedure which may be outlined as follows:

Behavior of child	Good Treat and save in a state of restored health if possible.	Bad Extract
Health of child	"	"
Clinical aspects	"	"

The radical opinion concerns itself solely with the possible injury to the child's health by retained infection, even for a few months or years, and refuses to believe it possible to eradicate the infection by any means short of

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extraction. Their verdict, therefore, is always to extract an infected deciduous tooth and to place space retainers, if their use is indicated.

Thus, we leave the members of the profession with the definite (?) attitude that they should do what they think best in each case.

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SHOULD PEDODONTIA BE A SPECIALIZED PRACTICE OR SHOULD IT BE INCLUDED AS A FUNDAMENTAL PART OF GENERAL DENTISTRY?*

WALLACE M. NICAUD, D.D.S., NEW ORLEANS, LA.

THE topic of our round table discussion is, "Should pedodontia be a specialized practice, or should it be included as a fundamental part of general dentistry?"

The operative management of children is a subject which has apparently been a bugbear to the dental profession since the very beginning of dentistry. The early literature contains little or no references to children's teeth. The pedodontist was not even heard of until recent years. In the last few years, however, rapid strides have been made in the field of children's dentistry. Many articles and books have been written on this subject. There are any number of specialists in this field, and the conscientious general practitioner gives much consideration to this phase of dentistry. Unfortunately, though, we find that quite a number still have an attitude of indifference toward children.

In analyzing this attitude of indifference among the general practitioners we find three main reasons: first, ignorance on the part of the dentist regarding the necessity for conservation of children's teeth; second, a very apparent fear of and dislike so many men seem to have for operating on children; third, that operations on children have heretofore nearly always been a waste of time for the busy practitioner when considered from a financial standpoint.

The first and second reasons may be largely eliminated by proper education of the dental student, and the third, by education of the parents.

Before the general practitioner performs any services for children he should ask himself, "Am I fitted temperamentally and otherwise to serve children in my practice? Do I look forward to their visits with pleasure, or does it spoil my whole day when I see in the morning's survey of the appointment book that I have to serve two or three children?"

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Now, he should be honest. If he dreads the visits of these youngsters, then, in fairness to all concerned he should do one of two things, realize the obligation he owes these children and strive to serve their needs as carefully and efficiently as he does those of adult patients, or refer them to some one who is equipped to care for them efficiently. How many of us have heard or have been guilty of saying to parents, "The baby teeth are intended to last only a few years and then be replaced, so it does not really matter much if they are lost. Fillings to preserve them would soon fall out and would have to be done over, so why bother with them? If the second teeth come out crooked, they can be straightened." Thus the voice of ignorance has salved many a conscience which would otherwise feel guilty.

When we hear such statements of ignorance and indifference, we feel the great need of specialists and the practice of referring young patients to them by the general practitioner who is not inclined to do children's dentistry. The time has not yet come when children's dentistry can be confined solely to the specialist and excluded from the general practice of dentistry. There are too few pedodontists in most localities, none at all in many.

If children's dentistry were excluded from the general practice of dentistry, one might ask the following questions: Would the profession, as a whole, continue to educate the dentist to the importance and value of children's dentistry? Would the dentist, in turn, take enough interest to educate the parents in the great need of dental services at an early age?

Who would take care of the children's clinics, and at present our great school program? Certainly specialization would be entirely inadequate to encompass such a task.

At what age do the pedodontist's services cease? At the eruption of the first permanent molar, second permanent molar, or third molar?

Would the child willingly return to the general practitioner after being treated by the pedodontist for ten or twelve years?

The consensus of opinion at our table is that pedodontia should be included as a fundamental part of general dentistry, but the younger practitioner should be encouraged and helped by the older ones to follow this specialty.

In conclusion, I hope that every dentist realizes the need of education in children's dentistry, especially in our dental colleges. Education of the dental student will make more men become interested in this branch of dentistry, the specialty will grow, so that at some future date pedodontia as a specialty may be regarded in the same light as orthodontia is today.

HOW CAN THE GENERAL PRACTITIONER BEST BE EDUCATED TO DO PEDODONTIA OR CHILDREN'S DENTISTRY SUCCESSFULLY?*

J. A. GORMAN, D.D.S., NEW ORLEANS, LA.

1. Take postgraduate instruction in a recognized dental college giving an improved and adequate course in pedodontia.

2. Do observational study in the office of a man or woman who does successfully practice and succeed with pedodontia.

3. Read textbooks published to date on children's dentistry. Study the current dental journals for methods, practices, technic, and plans and practices being employed by the best men in children's dentistry today. THE INTERNATIONAL JOURNAL OF ORTHODONTIA AND DENTISTRY FOR CHILDREN is the only journal I know of which has a full-time department devoted exclusively to children's dentistry. Have pedodontists on your state programs.

4. Begin taking some selected cases from charity and welfare organizations of your city during your spare time in the office. Get some extracted deciduous teeth and study dental anatomy, cavity preparations and x-ray examination of the child's mouth.

5. Begin insisting that your adult patients bring their children to you at an early age, before the ravages of decay have begun; keep these children coming every four to six months; do systematical prophylaxis and simple fillings for permanence. Learn as you work.

6. Instead of having children come at all hours, let it be known that you wish children to come in, say, two mornings a week. Date all children at this time, and do not be concerned with working for adults and children alternately. One cannot successfully do this. Be honest with parents, have an understanding about fees and prognosis of work before you begin. Be honest, fair, just, and watch what big dividends pedodontia will pay in every way.

7. Remember, you are a doctor of dental surgery; you are obligated to render a professional service to a human being or to refer that patient to some one who can and will. Education is needed more than restorations, and remember it is the lesson learned and carried home that counts, not your fillings, pulling or cleaning. Home care, and patient and parent responsibility must be explained, demonstrated and insisted upon. Ask and answer yourself—When you do not know how to make a porcelain jacket what do you do? When Aker's cases first came out, what did you do? You learned how to do them. I would suggest that the general practitioner admit facts, be honest, inform himself of best methods in children's work, and then win and earn his own respect as a doctor of dental surgery and a useful member of his profession and a worth-while citizen to his community.

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EARLY EXTRACTION OF DECIDUOUS AND PERMANENT TEETH NECESSITATING SPACE RETAINERS AND RESTORATIONS*

A. C. Broussard, D.D.S., New Orleans, La.

EVEN though this subject has been presented often, it will serve as a valuable reminder for the welfare of the children of today, who are our adult patients of tomorrow. It is by the care we give these children that we can really appreciate our efforts in humanity's cause—a cause that should be foremost in the mind of every one of us.

We should do our utmost to care for and to preserve the deciduous teeth and the first permanent molars, as they play a most important part in the development of the jaws. However, where there is a pathologic condition beyond our control, then, and only then, should we resort to extraction. In such cases the patient and the parents should be informed as to the change that will take place in the jaws, position of the teeth, muscles, facial form, and what the end-result will be, due to the drifting of the teeth. Patients should be advised as to the reason for and the method of maintaining these spaces, and a record should be made, because patients easily forget the advice given them and later blame the dentist for any resulting trouble.

Patients come to the dentist for service, and this service should include dental education in all of its phases—something that is sadly neglected by the dentist, a neglect which reflects on his integrity. An x-ray examination should be made of a child's jaws, especially where deciduous teeth have been extracted prematurely. If the x-ray pictures reveal the successive permanent teeth deep in the jaw, space retaining appliances should be placed in the mouth to hold the spaces for the successive permanent teeth.

The type of space retaining appliances, and the detail of construction will not be discussed here, as there are various types which can be constructed to suit the individual case. But, in constructing these appliances we must bear in mind that teeth move individually in the process of mastication; therefore, a movable type would be preferred in order to allow each tooth to function independently of the other teeth, thus allowing free development of the jaws.

In embryology we must consider the formation of the tooth germ as preceding bone formation; the multiplication of cells influence growth, and for growth the cells must have proper support—the intercellular substance. The cells give the vital characteristics to the tissue, the intercellular substance the physical characteristics, and the cells, through influence of their environments, build the intercellular substance for growth and adapt themselves to these environments—there being a continual building and destruction throughout life depending upon environments. The intercellular substance is entirely

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dependent upon the cells for its formation, growth, and maintenance in a normal state.

The deciduous teeth have a definite position and function. When they are lost at an early age, they cause the others to drift around to positions of least resistance, resulting in closing up of spaces and the loss of proper contact, which is essential in jaw development; improper mastication, causing blood circulation to become sluggish, and affecting the proper growth and calcification of the successive permanent teeth; the arrest of growth of the supporting structures; the associated muscles and the entire skull from lack of proper massage.

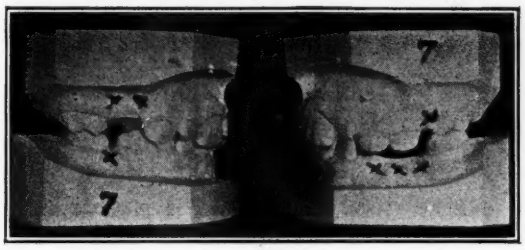

Fig. 1.

Fig. 2.

Fig. 3.

The multiplication of cells, forces of occlusion, proximal contact, muscles and associated parts, and the eruptive forces of the permanent teeth develop the maxilla forward, outward and downward—and the mandible forward, outward and upward. Where the deciduous teeth are extracted, a reduction in the size of the jaws will result, as with adult patients where the teeth have been extracted. In such cases space retainers should be constructed so as to preserve the spaces for the successive permanent teeth. The space retainers at their best are poor substitutes for the deciduous teeth; yet they are a necessity to prevent the conditions mentioned above which result from early loss of deciduous and permanent teeth, as shown by the following cases.

CASE 1.—Patient aged seven years. The loss of the maxillary right deciduous molars, maxillary left second deciduous molar, mandibular right second deciduous molar, and mandibular left deciduous canine and molars—note the elongation of the maxillary left teeth and dropping of the process. (Fig. 1.)

CASE 2.—Patient aged nine years. Good occlusion right side, maxillary left second deciduous molar lost showing permanent molar drifted mesially half the width of the molar. (Fig. 2.)

CASE 3.—Patient aged nine years. Loss of mandibular right and left first permanent molars and mandibular right and left second deciduous molars causing the mandibular anterior teeth to drift distally and dropping of the maxillary process. (Fig. 3.)

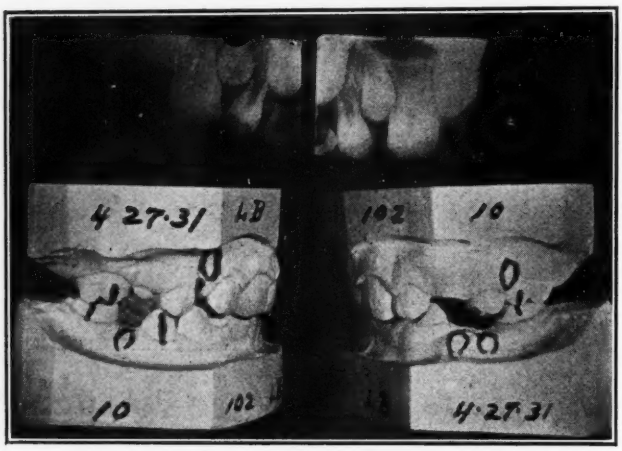

Fig. 4.

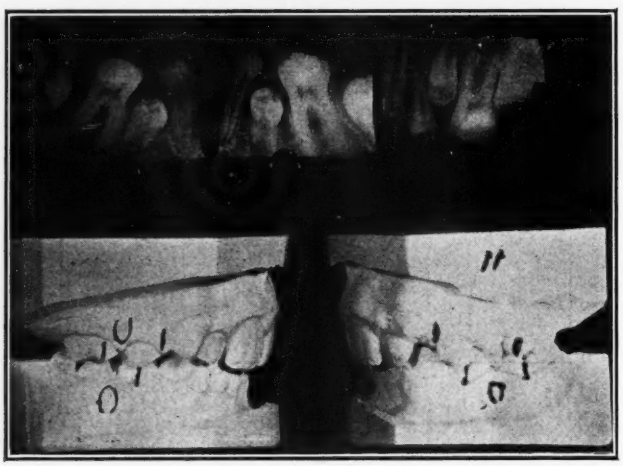

Fig. 5.

CASE 4.—Patient aged ten years. Early loss of maxillary and mandibular deciduous molar resulting in general reduction in the size of the jaws and leaving no room for the premolars and permanent canines. (Fig. 4.)

CASE 5.—Patient aged eleven years. The maxillary and mandibular right and left first permanent molars drifted mesially and the mandibular anterior teeth distally crowding the mandibular right and left second premolars and maxillary right second premolar, due to early loss of the deciduous molars. (Fig. 5.)

CASE 6.—Patient aged fourteen years. Early loss of mandibular right and left first permanent molars causing mandibular right second molar to drift mesially, and the remaining mandibular teeth to drift distally taking a lingual position to the maxillary teeth—maxilla

well developed. (Fig. 6.) Mandibular left second molar in practically horizontal position, not fully erupted as shown by x-ray pictures. (Fig. 7.)

Fig. 7 draws x-ray pictures of Case 6. Upper left x-ray picture shows mandibular left second molar in practically horizontal position, and upper right x-ray picture shows tip-

Fig. 6.

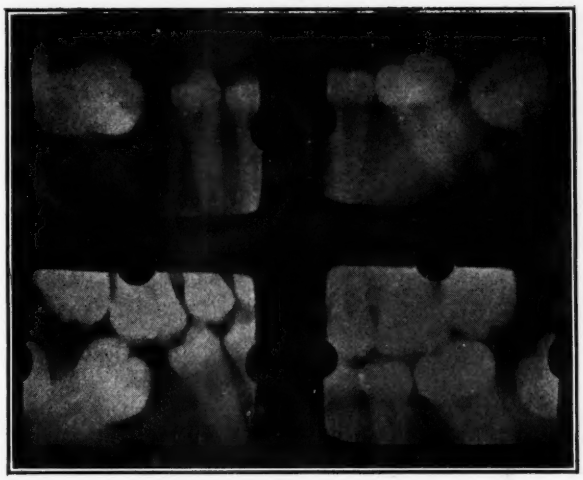

Fig. 7.

Fig. 8.

ping of mandibular right second molar, due to early loss of mandibular first permanent molars. Lower x-ray pictures show the direction of occlusal forces which will result in possible bone destruction as pictured in Fig. 8.

Case 7.—Patient aged forty-five years. Fig. 8 is practically identical to Fig. 7 of Case 6, showing amount of bone destruction due to trauma. Compare with Fig. 7.

Case 8.—Patient aged thirteen years. Early loss of mandibular second deciduous molars crowding mandibular right second premolar. Mandibular left second premolar missing as shown in x-ray picture. Note drifting of mandibular eight anterior teeth distally. (Fig. 9.)

Case 9.—Patient aged fourteen years. Good occlusion on left side. Mandibular right second premolar impacted; mandibular right anterior teeth drifted distally as a result of early loss of mandibular right second deciduous molar. (Fig. 10.)

Case 10.—Patient aged fourteen years. Fairly good occlusion on left side. Early loss of maxillary right second deciduous molar causing maxillary right molars to drift mesially and crowding the premolar. Maxillary right first molar rotated. (Fig. 11.)

Fig. 12 shows common type of impactions frequently seen, due to premature loss of deciduous teeth.

Fig. 9.

Fig. 10.

The early loss of permanent teeth, especially the mandibular first permanent molars, as shown in Cases 3 and 6, is a problem that must be met. Patients and parents must be taught that the first permanent molars are the most important teeth we have. Most parents believe that they are deciduous teeth and need no attention because they are thought to be lost soon. The deciduous teeth are there for a definite purpose, and the parents should be educated to their value, which in turn would save the best teeth—the first permanent molars.

The cases presented show an idea of everyday conditions, and it is time that we devote our knowledge to the future welfare of children. We are spending time, effort, and energy in trying to save pulpless teeth without knowing what the future holds for them, and yet no time or consideration is given to maintaining jaw development or saving perfectly good sound teeth

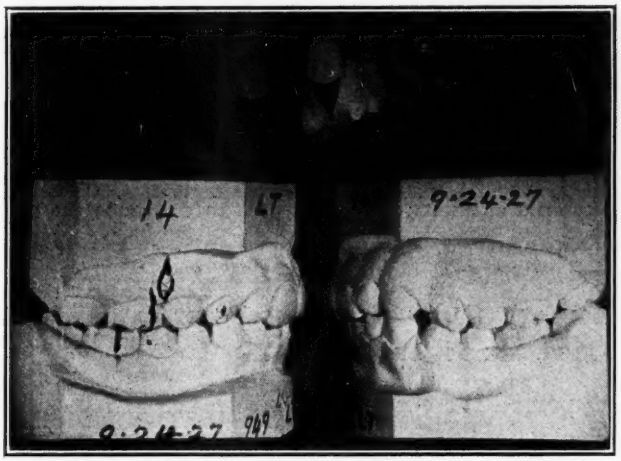

Fig. 11.

Fig. 12.

which were not given an opportunity and have remained unerupted, causing the other teeth to be out of gear and resulting in trauma. We are thinking and talking dental economics in all its phases, and I feel that it is time to think of tissue economics. I know the end-results will be far more gratifying than the unknown future of pulpless teeth.

ABSTRACTS OF
CURRENT LITERATURE

NUTRITION AND PEDIATRICS

By Samuel Adams Cohen, M.D., New York City

A Study of Secondary Cases of Scarlet Fever. William H. Best. N. Y. State Jour. Med. **33**: 14, 1933.

The isolation period for cases of scarlet fever in New York City is thirty days, provided desquamation has ceased and there is no abnormal discharge from the nose, ear, or mastoid, and no enlarged cervical glands. Contacts are not quarantined but some individuals—school children, school teachers, food handlers—are excluded from work or school.

In order to ascertain whether this period of isolation and exclusion is unnecessarily long, Best, who writes from the Bureau of Preventable Diseases, Department of Health, New York City, made a worth-while study of secondary cases developing in scarlet fever contacts to determine at what period during the convalescence of the primary cases secondary cases developed. All told 11,357 cases of scarlet fever were reviewed and 8 per cent of these were secondary cases. There were 37,788 contacts and 2.4 per cent of the contacts developed scarlet fever. Of the secondary cases over half, or 56 per cent, occurred within one week after the onset of the primary case and were in all probability contracted either from the same source as the primary case or from the primary case before its isolation.

The author found that the susceptibility to scarlet fever of the age group sixteen years or over is comparatively slight. Because there is a gradual diminishing infectivity in uncomplicated cases of scarlet fever up to the twenty-first day Best states that these cases may be terminated on that day with no greater danger to the community than terminating it on the thirtieth day. On the other hand complicated cases should be isolated until the complication is cleared up unless it can be demonstrated by culture that discharge coming from the nose, ears, mastoid wound or from broken-down glands is free from contagion.

Best brings out a point which can stand repeated emphasis when he states that since the infectivity of desquamation is an obsolete theory, cases of scarlet fever may be terminated without regard to its presence.

The Calcification of Tissues by Excessive Doses of Irradiated Ergosterol. C. I. Reed, L. M. Dillman, E. A. Thacher, and R. I. Klein. J. Nutrition **6**: 4, 1933.

These investigators, who write from the Department of Physiology, University of Illinois, Department of Medicine, add to the number of contributions which have been made in regard to the calcification of tissues by excessive doses of irradiated ergosterol. Using 13 normal dogs as controls the authors compared the tissues and organs of these animals with those of 14 dogs that were given excessive doses of irradiated ergosterol intravenously.

As has been noted by others, the authors found wide variations. The calcium content of any tissue may be significantly increased by viosterol administration; certain tissues showed no increase in calcium content, while other tissues or organs of the same animal showed considerable increase. The magnitude of the increase in calcium content was not correlated with the viosterol dosage but as has been observed frequently in other experimentations on nutritional problems, the end-results seem to depend on some undetermined individual factor or factors.

While results vary widely among individual animals, the phosphorus content of tissue and organs was affected by viosterol administration in a much less constant manner—if at all.

Secondary Suppurative Parotiditis. R. F. Weyher. Jour. Mich. State Med. Soc. **32**: 7, 1993.

Weyher does not include primary or acute epidemic parotiditis (mumps) in his discussion of secondary suppurative parotiditis. He discusses the causes of the latter under two main groups: (a) hematogenous and (b) local.

The hematogenous group is further subdivided into (1) terminal suppurative parotiditis which as is implied is a concomitant condition seen sometimes in individuals who are failing or in a markedly debilitated condition; (2) suppurative parotiditis as a complication of acute contagious diseases; (3) suppurative parotiditis which occurs as a postoperative complication particularly after laparotomy or after surgery within the pelvis. (This condition is serious and mortality statistics vary between 33 to 48 per cent.)

The etiology of secondary suppurative parotiditis from local causes divides itself into (1) oral sepsis occurring directly through Stenson's duct; (2) extension of inflammation from the pharynx and retropharynx; (3) extension from otitis media; (4) trauma including pressure on the jaw during the administration of anesthesia; (5) abscessed tooth with or without extraction and (6) salivary stasis resulting from an intake of atropine or lack of salivary stimulation. The author is of the opinion that conditions which make for salivary stagnation predispose to parotid gland infection.

In discussing the bacteriology of this suppuration Weyher states that *Staphylococcus aureus* is found to be the most common organism. The streptococcus occurs rather frequently in virulent cases. The pneumococcus is rarely found and when it does occur it has a serious import. The treatment

of secondary suppurative parotiditis varies, but the consensus of opinion leans toward early incision when there is definite fluctuation. The application of cold packs and also radium therapy have found favor with those who do not lean toward surgical procedures.

In regard to complications of this condition this Detroit physician mentions abscess in external auditory canal or in the temporal fossa, facial paralysis, infection of internal jugular vein, temporal neuralgia and gangrene.

In discussing the prophylaxis of this clinical entity the author stresses the importance of oral hygiene during illness. During an operation with general anesthesia he warns against exerting too much pressure in raising the patient's lower jaw because this introduces the element of trauma. After operation he advocates early mouth feeding to stimulate salivary secretion. He feels salivary stasis may also be avoided by the chewing of gum or giving of some such substances as lime lozenges to suck. Because of its effect to inhibit salivary secretion atropine should be cautiously used. Furthermore the author rightly stresses the importance of prophylactic measures in combating postoperative dehydration as a means of preventing suppurative parotiditis.

A Survey of an Opportunity Room for Gifted Children. Norma Scheidemann and Margaret S. Smith. J. Educational Psychology **24**: 5, 1933.

Because as the authors state children of high intelligence rating are regarded to be superior physically, emotionally, scholastically as well as intellectually Scheidemann and Smith report their interesting observation on a group of 22 children who were segregated for special instruction in a public school in Los Angeles, California. As in public schools of many other cities the selection of the group is based solely upon a high intelligence quotient.

As a result of their study the authors found such physical defects as defective hearing and defective vision to be quite common in this particular group. It is singular that the posture of none of these children could be rated as excellent. The teacher of this group further observed that in the physical and emotional qualities these selected children compare unfavorably with normal children. It was noted, as has been observed by others, that children gifted intellectually may be average or for that matter even inferior in other traits.

These writers strike a responsive cord with many who are interested in child welfare and child training when they state that in many instances the training of a gifted child's weak traits is ultimately of greater value than the disproportionate training of its gifted traits.

THE FORUM

IN CONTINUING the discussion which appeared in a recent issue of the INTERNATIONAL JOURNAL OF ORTHODONTIA AND DENTISTRY FOR CHILDREN, upon the subject of the advisability of the surgical removal of the maxillary labii frenum, of interest to our readers will be the comments of Dr. Sydney W. Bradley, of Ottawa, Canada. Dr. Bradley says:

"Dr. Dewey answers Dr. Caine's query concisely and definitely. If the frenum is abnormal, remove it; if not, leave it alone. Dr. Varney Barnes in his letter describes the abnormal frenum lucidly.

"The best time for surgical interference with an abnormal frenum is when the permanent central incisors have erupted far enough to put bands on them comfortably. Before removing the frenum these bands are fitted and cemented to place with whatever attachments the operator likes best. At present I am using the new Angle edgewise arch bands. If the movement of the incisors cannot be controlled in bringing them together, it will be necessary to band the first permanent molars and use an alignment wire. After anesthetizing the tissues by infiltration, an incision with a straight bistoury is made around the lingual tuft of the frenum. This is grasped by a pair of small artery forceps and dissected away. Two incisions are next made between the teeth, carefully, so as to remove only the fibrous cord and not disturb the periodontal tissues. The cord is dissected away until you are well over on the labial. Then the excess tissue holding the lip down is removed with gum scissors, a V-shaped piece being removed with the apex of the V about 8 millimeters from the gingival border. A cautery may be used now to remove any loose ends of tissue remaining, but if the frenum has come away nicely, this will not be necessary. Sutures may be used to bring the edges of the freshly exposed labial surfaces together, but they are not absolutely necessary. The teeth are now ligated with silk ligature and the patient is told to lift the upper lip upward and outward two or three times daily, to prevent the raw lip surfaces uniting with the raw alveolar surface. The teeth will move together nicely aided by the healing process.

"Some years ago, I decided not to remove any more frenums, as I thought that if some of my friends could get away without doing it so could I, but I find there are a few cases each year which require surgical removal to obtain the best results with the least effort. Just recently I had a case under treatment where the labial part only of the frenum had been removed. The central incisors would drift apart several millimeters, if not held together. I decided to remove the lingual tuft of the frenum which impinged on the gingivolingual margins of the incisors. Since this has been removed, the central incisors are staying together nicely. I recall another case where it was necessary to remove only this lingual tuft of tissue without disturbing the labial attachment which was normal, to keep the incisors together, and without its removal they separated every time the appliance was removed."

SYDNEY W. BRADLEY.

BOOK REVIEW

Unsere Patienten und Wir*

Unsere Patienten und Wir. By Dr. Erich Heinrich, Dresden.

The subtitle of this work, "Psychologic Fundamentals and Their Practical Application for the Success in Dental Practice," indicates that we are dealing with a combination of the subjects of psychology, dental and general economy, and the principles of business as applied to and used by the dental profession. These subjects, usually covered in the United States under the headings—dental ethics and economics—are grouped by the author in the following ways: human correlations between dentist and patient; equipment and office; correct attitude in case of differences of opinion, problems of fees, legal questions, and in dealing with fellow practitioners; psychology of children's dentistry; dental economics proper; namely, assistance, keeping of records, bookkeeping, income tax, and work under the social insurance plan; and finally the dentist's personal hygiene, professional diseases and their prevention, proper use of leisure time and mental hygiene.

This short outline merely touches on the large number of individual problems contained in this book. While many of the subjects are well known to the American dental practitioner, and others are specifically adjusted to the German public psychology, the work contains chapters that should be extremely interesting to the dentist in this country. The author's discussion of the work under the health insurance plan (Krankenkassen) gives a valuable insight into this system by which at present the vast majority of dentists in Germany are vitally influenced. From his description of the advantages and disadvantages of this type of work in everyday practice, much can be learned that might at some future time be of importance to everybody.

R. KRONFELD.

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EDITORIALS

Frank M. Casto, President-Elect

OF MORE than passing significance to the readers of THE INTERNATIONAL JOURNAL OF ORTHODONTIA AND DENTISTRY FOR CHILDREN is the honor conferred upon Frank M. Casto by the American Dental Association, in electing him president-elect during the recent centennial meeting in Chicago.

An enumeration in detail of the professional activities of this dynamic individual over a period of years, dating back to 1898, would be just about as voluminous as an enumeration of the individual aerial conquests of a Lindbergh. Following, however, are a few of his foremost activities. He has been dean of the School of Dentistry, Western Reserve University, from 1917

and still continues in that position; he holds degrees in dentistry, medicine, and pharmacy from Ohio State University; he was graduated from the Angle School of Orthodontia in St. Louis, Missouri, in 1902. Besides carrying on an extensive and active practice in orthodontia in the city of Cleveland, Ohio, since 1902, he has been vigorous and active in dental affairs throughout America for many years.

The American Dental Association has elected as its next leader, a man of outstanding, native talent; one of wide and extensive contacts and experience, even apart from the dental profession. All add to his value as a leader of the organization.

The readers of this Journal will be pleased that the American Dental Association has chosen Dr. Casto, recognizing his ability as an organizer, at a time of all times when the professions need forceful, careful leadership. Another pioneer in orthodontia and children's dentistry has been elevated to the highest position in organized dentistry.

The Committee for Dental Health Survey

AT THE suggestion of the Chairman of the Committee on Legislation, Dr. Homer C. Brown, the House of Delegates took action at the meeting in Buffalo, New York, which authorized the creation of a Committee for Dental Health Survey.

Present conditions have made many realize the need and importance of obtaining more detailed information pertaining to dental health, particularly to the dental health of children. Accordingly, the president of the American Dental Association consulted the United States Public Health Service to ascertain just how much interest the Department of Public Health might have in a dental survey of America.

Later, at a conference arranged between representatives of the American Dental Association and these allied departments, along with Surgeon-General Hugh S. Cumming and Chief Dental Surgeon of the United States Public Health Service, C. T. Messner, the Surgeon-General approved the idea, and assigned experienced officers of the Public Health Service to direct this fact-finding survey, working in cooperation with the committee of the American Dental Association.

The movement was approved by the Board of Trustees of the American Dental Association, cooperation was pledged, and $200 was appropriated for small, incidental expenses pertaining to organization. The president of the A. D. A. then appointed a committee, known as the Committee for Dental Health Survey, composed of twenty-nine (29) members, representing the professional, educational, legislative, and civic phases of dentistry. The membership of the committee has been distributed geographically in order that its work may be widely extended throughout the country. The Executive Council consists of the following members: Drs. C. T. Messner, Chairman,

H. T. Dean, Secretary, Homer C. Brown, F. C. Cady, C. Willard Camalier, W. H. G. Logan, Frederick H. Lum, Jr., Albert L. Midgley, J. Ben Robinson.

Following are the purposes of the committee:

1. To study the needs of the public from a dental standpoint.

2. To survey existing dental health facilities in state, municipal and county health and educational organizations.

3. To study means and methods of meeting the problem.

The success of the survey, upon which progress has already been made, is assured through the cooperation of the Surgeon-General's office and the American Dental Association, and hitherto unavailable, valuable information will be obtained.

NEWS AND NOTES

Thirty-Second Annual Meeting of American Society of Orthodontists to Be Held in Oklahoma City November 8, 9, 10

Oklahoma City is ready to welcome you to the thirty-second annual meeting of the American Society of Orthodontists. If you have studied the program, you must agree that it promises to be one of the most outstanding conventions in the Society's history.

The new Oklahoma Biltmore is another descendant of the famous Bowman line of hotels known from coast to coast. This pretentious twenty-six story hotel offers every modern facility and convenience for staging the meeting and caring for its members and guests.

The large, commodious, sunlit civic room with a large stage will accommodate 600 persons. Two beautiful banquet rooms connecting with the civic room will be used for the exhibits and special sectional programs of the convention.

Oklahoma City Golf and Country Club

Large luxurious lounges located a few steps above the main lobby are the last word in modern beauty and appointments, one section of which is most unique in its modernistic scheme of decorations. Here is an excellent place to meet and enjoy your friends.

To dine in the quietude of the main dining room or the hustle and bustle of the coffee shop is to satisfy the most exacting appetite.

A large parking ground will be found adjoining the hotel and a new eight story auto hotel one-half block away.

One of the outstanding social events will be a bridge luncheon for the ladies. They will be entertained by the ladies' auxiliary of the Oklahoma State Dental Society. It will be held in the Oklahoma Club located one-half block from the hotel on the same street.

All the fine features of a modern hotel and down town city club are to be found in this building. It has billiard and pool rooms, card rooms, private and open dining rooms, bedrooms, and suites, and all the spacious and luxurious lounge rooms any one could desire. If you prefer the atmosphere of a club, you may stop here at very reasonable rates.

The golfer will be thrilled with the wonderful $300,000 club house and the beautifully landscaped golf course of the Oklahoma City Golf and Country Club. The course was designed by Dr. A. Mackenzie of the Moor Allerton Lodge, Leeds, England, and Perry D. Maxwell, one of

America's outstanding golf architects, and Dr. Mackenzie's partner. The twenty-seven holes offer a grand test for golf—difficult enough to keep the best player on his mettle and not so difficult as to discourage the duffer.

It is located in a suburban residential section that is rapidly filling up with many beautiful and palatial homes. It is a separate municipality of 2700 acres and is known as Nichols Hills. It was named in honor of the promoter, Dr. G. A. Nichols, who before entering the real estate business was a practicing dentist in Oklahoma City.

Biltmore Hotel

Oklahoma Club

The club house which is the social center is lavishly furnished and equipped for every social occasion. More than two years were spent in planning it. It is characterized, above all, by architectural distinction and by picturesque furnishings, fixtures and finish.

It is here one may loll in a gorgeous lounge room under high beamed ceilings in softly upholstered furniture after a waltz or an exciting round on the links.

If you prefer the outdoors, you may take to the comfy chairs of the screened-in observation porch facing the links and the city. A good view of the links may be had during the day, and the different colored and twinkling lights of the city and oil field are to be enjoyed at night.

The main dining room is separated from the ballroom by colonnades, and with its many tables set with glass, silver and linen makes an imposing sight.

Then there is the ballroom with its myriad lights and its vast amount of floor space awaiting the swish of beautiful gowns and the glide of dancing feet, while an orchestra in the balcony pours forth intoxicating melodies. It is here the annual dinner of the American Society of Orthodontists and the Oklahoma State Dental Societies will be held.

How can you resist the call of Oklahoma City for you to attend the meeting of the American Society of Orthodontists? We do not believe you will. WE ARE EXPECTING YOU!

Local Arrangements Committee:

T. Wallace Sorrels,
Carl D. Strickler,
Harry H. Sorrels.

Outline of Program of the American Society of Orthodontists, Oklahoma City, Okla., November 8, 9, 10, 1933

The program committee of the American Society of Orthodontists, with Dr. Paul G. Spencer as chairman, has been doing some diligent and effective work in the preparation of the literary program for the Thirty-Second Annual Meeting in Oklahoma City, November 8, 9, 10, 1933. The program is well balanced and of a high order. This announcement of the program is more or less of a general survey and no attempt at a detailed analysis.

Knowing that the subjects of diagnosis and treatment are always of interest to our membership, the program committee has arranged for a series of papers to be presented at the morning sessions, discussing several of the most common types of malocclusion. These papers will be presented by some of the most capable men in our profession.

Discussers have been chosen because of their special preparation to develop additional information on the respective subjects. There will also be ample time for some general discussion of each paper.

A case report or two will be given to further illustrate and coordinate the subjects being presented. The program committee has planned and outlined this phase of the program so that each and every member will carry home something practical that can be of use in his daily routine of diagnosis and treatment of cases; that will bear fruit in practical results.

The afternoon of the first day will have in store a very interesting series of papers.

Dr. Carlton J. Marinus, of Detroit, Michigan, an authority of note on the study of ductless glands, will present a paper on "Endocrine Factors in the Development of the Teeth and Jaws."

Dr. C. C. Howard, of Atlanta, will open the discussion. Other men schooled in this subject will also discuss these problems. A general discussion will follow. This will be one of the outstanding features of the meeting.

In orthodontic literature, the effect of hay fever and asthma on the development of the bones of the face has been given little consideration. Since normal breathing is more or less interrupted, it is considered that there must be a lack of general development in the nasal region which will have a deterrent effect upon the growth and development of the dental arches.

Dr. Ray M. Balyeat, Oklahoma City, a nationally known authority on hay fever and asthma, will give us his findings in a paper on "Allergic Rhinitis in Children"; a consideration of its relation to facial and dental development.

In Montana, bone dust is fed to cattle. Should not the growth and development of a child have as much consideration as that of a calf? Another paper of unusual interest which deals with this subject will be presented by Dr. H. G. Harper, Professor of Soils in the Oklahoma Agricultural and Mechanical College, Stillwater, Oklahoma.

We have had many phases of diet and nutrition presented before our sessions. We have prescribed certain foods as a balanced diet for our patients. Results have not been

what we desired. Doctor Harper will open the subject of the possibilities of frequent failures in prescribed and balanced diets in his discussion of the deficiency of food elements in soils, especially considering the food elements of calcium and phosphorus. He has done a great amount of research work on the subject and has been recommended through Dr. A. H. Ketcham, Denver, Colorado, and by Dr. George A. Stiles of the U. S. Department of Animal Husbandry, as the best authority on this subject. Perhaps more than we know, our own children and patients may need "bone dust" or its equivalent, in foods containing insufficient amounts of calcium and phosphorus.

An able authority on nutrition will open the discussion on Doctor Harper's paper.

Enough new thoughts will be presented this first afternoon to warrant the trip to the meeting.

Dr. Joseph E. Johnson, Louisville, Ky., will present a paper on the "Twin Wire Appliance." He will at the general clinic, demonstrate further the adaptation and use of this appliance. Dr. Johnson always has something of interest. This appliance has many features of unusual merit. You will be glad that you have seen it.

Again we will have the distinct pleasure of having a paper by Dr. John Marshall, bringing a further report and a summing up of the research work in connection with the treatment of monkeys that have been fed a varied diet. His microscopic tissue slides will be projected on the screen where the specimen can better be studied and described than through numbers of microscopes. This will be a worthwhile report and should be heard by every member of our organization.

Dr. Homer B. Robison, Hutchinson, Kansas, a member of the program committee, will have a carefully chosen list of case reports which will be comparable in character to that of other papers. His experience in preparation of programs assures us of case reports of unusual interest.

Dr. Ernest N. Bach, Toledo, Ohio, past president of the Great Lakes Society and a member of the program committee, has a treat in store for us in the general clinics. He has a surprise for you—a new feature. You will like it. The clinics have been selected because of their value in giving something worth while and of use in your office.

This is merely an outline of what will be presented at the meeting in Oklahoma City.

It would be impossible to give the importance of each presentation in detail. This is enough to indicate the high type of program that will be presented.

A complete program in detail will be published in the October issue of the Journal.

At the Executive Council meeting in Chicago in August, the sentiment was unanimous that there be no 1934 meeting. The American Society most likely will favor this suggestion.

In view of this likelihood, I am sure many of the members who have thought they might not attend the 1933 annual meeting will now make their plans to be in Oklahoma City, November 8, 9, and 10.

W. E. Flesher,
President.

Air Your Way to the Meeting of the American Society of Orthodontists in Oklahoma City, Oklahoma

In 1850 it required not less than twelve days to make the wearying, perilous journey from either coast to the rolling prairie that was to be the site of Oklahoma City.

In that year a small part of the journey from the Atlantic seaboard could be made by train—at a speed but little faster than a horse could trot. The greater part of the distance was covered by stage coach, neither a comfortable nor a rapid means of transportation.

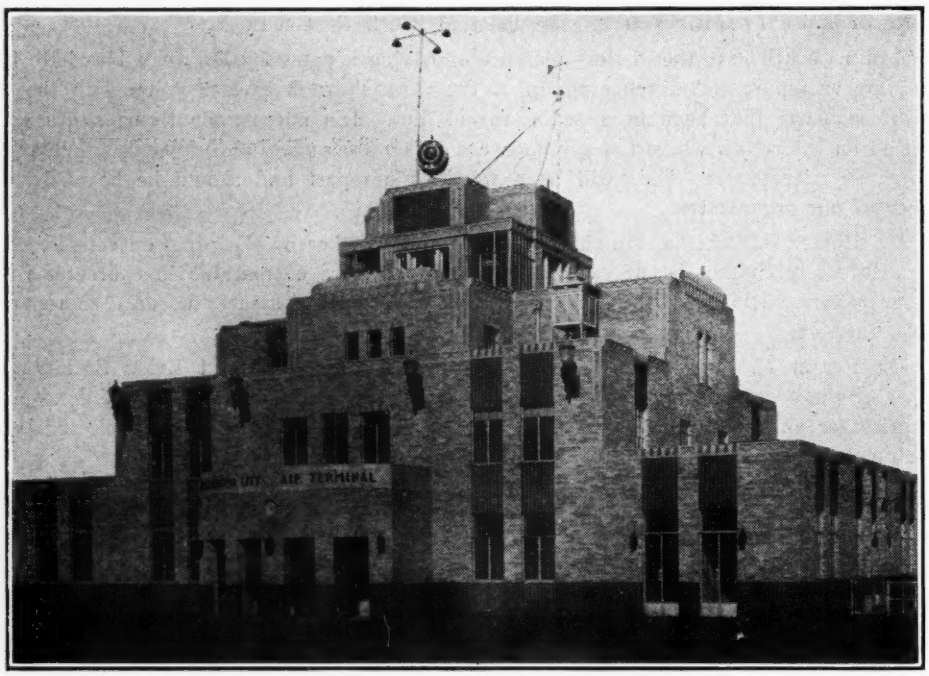
In 1933 delegates to the annual meeting of the American Association of Orthodontists residing on either coast may, if they desire, step aboard a transport plane and arrive in Oklahoma City, the meeting place, within ten and one-half hours.

The same service is available for the return trip, so that the New York City or the Los Angeles delegate need spend but twenty-one hours en route to and from the convention—instead of the twenty-four days that were required for the journey of two generations ago.

Six air transport lines operate thirty-two passenger and express schedules daily out of Oklahoma City, most of these from the new, modern, 640-acre Municipal Airport near the city.

Twelve of these schedules carry mail in addition to passengers and express. Night schedules are in effect to Dallas and Chicago, where connections are made for many other points.

Oklahoma City is at the intersection of two major transcontinental air lines, operating over government-lighted airways. United Air Lines operates both day and night passenger, express and mail schedules from Chicago through Kansas City and Oklahoma City to Dallas. Transcontinental and Western Air operates through Oklahoma City on its coast-to-coast schedules. Both lines make convenient connections with other sectors of their own and other lines to provide practically overnight or one-day service to all important cities in the country.



Oklahoma City Municipal Air Terminal

The modern, completely equipped, air terminal building at the Municipal Airport provides adequate facilities for handling the large volume of air traffic that flows through the port daily over the two lines mentioned and four others.

The field has been pronounced by aviation officials, both private and governmental, as one of the best in the country. It replaces a smaller port operated for several years by the Oklahoma City Chamber of Commerce, from which operations were transferred about a year ago, upon completion of facilities at the new airport.

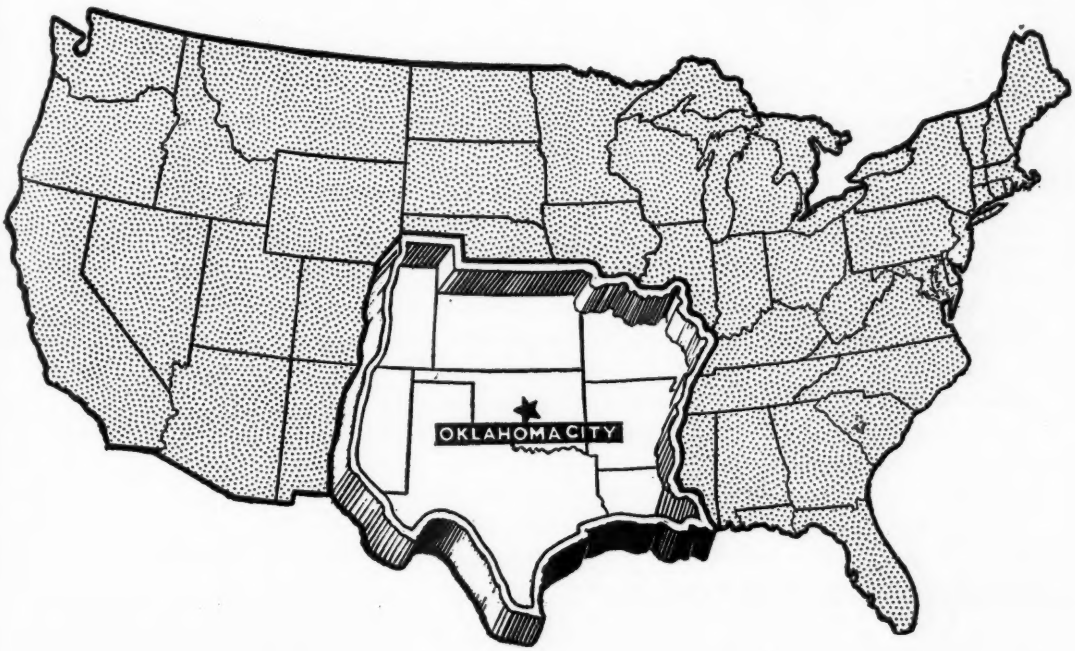
Curtiss-Wright Airport, northwest of the city, is under lease to Braniff Airways, a locally owned transport company operating convenient, high-speed schedules between Oklahoma City, Kansas City and Chicago.

Passengers entering Oklahoma City by air secure a remarkably interesting view of this metropolitan city, with its thirty-three-story office buildings and extensive park system and the great Oklahoma City oil field with its more than 1,000 derricks immediately adjacent to the city.

Oklahoma City's aviation development, advanced as it is, is but in line with the progress of this up-to-date community—product of that pioneer spirit that has placed Oklahoma well up in the forefront among the states.

American Society of Orthodontists Annual Meeting in Oklahoma City November 8, 9, and 10

The Thirty-Second Annual Meeting of the American Society of Orthodontists will be held November 8, 9, 10, 1933, in the Biltmore Hotel, Oklahoma City, Oklahoma.



The geographical location of Oklahoma City, near the central section of the United States, will make it reasonably easy to reach from all sections of the country over the highways, railways, and airways, or any way you choose to come.

The American Society of Orthodontists and Oklahoma City are calling you to attend.

The American Board of Orthodontia

The fourth annual meeting of the American Board of Orthodontia will be held in Oklahoma City at the Biltmore Hotel on November 6 and 7, 1933.

Those orthodontists who desire to qualify for a certificate from the Board should secure the necessary application form from the secretary. Applications received up to the date of the meeting in Oklahoma City will receive preliminary consideration by the Board and the required examination will be outlined. It will not be necessary for new applicants to appear before the Board at this time. However, such applicants should appear before the Board at the next annual meeting.

Attention is called to the following resolutions adopted by the Board:

Any person desiring to make application to the Board for a certificate shall have been in the exclusive practice of orthodontia for a period of not less than five years or an equivalent to be determined by the Board and based upon the following conditions:

First, an instructor in orthodontia in a school satisfactory to the Board.

Second, an associate in the office of an orthodontist whose standing is satisfactory to the Board.

It is, however, definitely to be understood that any person at the time of making application for a certificate shall be in the exclusive practice of orthodonia in his own name.

ALBERT H. KETCHAM, President,
Republic Building,
Denver, Colo.

OREN A. OLIVER, Secretary.
Medical Arts Building,
Nashville, Tenn.

Greater New York December Meeting

The Ninth Annual Greater New York December Meeting will be held at the Hotel Pennsylvania, New York City, December 4 to 8, 1933.

This meeting is held under the auspices of the First and Second District Dental Societies of the State of New York.

CARROLL B. WHITCOMB, Chairman.

Notes of Interest

Of interest to orthodontists is the fact that Governor Hill McAlister has announced the inclusion of an orthodontist on his personal staff of eighteen colonels. Dr. Oren A. Oliver of Nashville, Tennessee, has been announced as Assistant Chief-of-Staff, with the rank of Brigadier-General.

Dr. Sidney E. Riesner and Dr. Josephine M. Abelson announce the removal of their offices to 136 East Thirty-Sixth Street, New York City, where they will continue the practice of orthodontia exclusively.

Dr. William R. Root announces the opening of his office for the exclusive practice of orthodontia at 925 Delaware Ave., Buffalo, N. Y.

Dr. Allert Lange announces the establishment of his offices for a practice limited to orthodontia at 1 South Pinckney Street, Madison, Wisconsin.